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OF THE

FEDERATED MALAY STATES.

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EDITORIAL NOTES.

THE AGRICULTURAL BULLETIN.

IT is proposed during the present year to continue the *Agricultural Bulletin* as a quarterly publication. It is regretted that staff shortage and absence of many officers on leave have rendered it difficult to keep the publication of the bulletin up to date during the past year, but there will be little difficulty in accomplishing this within the next few months, with the return of many of these officers and the arrival of newly appointed ones, and in the coming year it is hoped to resume monthly publication.

STAFF.

Mr. F. G. Spring, Agriculturist, returned from long leave on 20th March, 1921.

Mr. D. H. Grist, Agricultural Instructor, reported his return from long leave on March 25th, 1921.

Mr. Grist spent five weeks in Ceylon in order to study the system of agricultural education obtaining in that Colony.

DEPARTMENTAL MUSEUM.

The need of a departmental Museum of Economic Biology has long been felt, but staff shortage during the last few years and lack of accommodation have made such an undertaking hitherto practically impossible. Fortunately, the first of these obstacles has now to a considerable extent been removed, and though accommodation is still quite insufficient and unsuitable to attempt anything on an extensive scale, it has been found possible during the early part of the present year to collect and set up a number of exhibits that will constitute a nucleus for future development. For the present, attention is being directed mainly to the preparation of specimens, models, drawings and photographs, illustrating the commoner pests and diseases of rubber,

coconuts and padi. It is not, however, proposed to confine attention only to pests of these crops, and exhibits of many other pests of crops and stored products will be prepared in due course,—some already have been completed.

In addition to pests and diseases, the Museum will contain exhibits of general agricultural interest, illustrating such matters as the cultivation of padi and other food crops, spices and cover crops, and the preparation of various oils, fibres, rubber and other products of economic importance.

The majority of the exhibits, so far completed, was sent to London early in April, and will form the main portion of the Government Exhibit at the forthcoming International Rubber and Allied Industries' Exhibition; these will be returned at the close of the exhibition, and, with the numerous other exhibits now nearing completion, will be displayed in such accommodation as is available in the present departmental buildings.

Exhibits have now been prepared illustrating the following:

PESTS AND DISEASES OF RUBBER.

Black Stripe Canker (*phytophthora*)
Mouldy Rot (*Sphæronema fimbriatum*)
Pink Disease (*Corticium*)
Diplodia
Fomes
Ustulina Zonata
*Wet Rot**
*Thread Blight**
*Rubber Mite**
"Spot" disease of prepared rubber

PESTS AND DISEASES OF COCONUTS.

Rhinoceros Beetle (*Oryctes rhinoceros*)
Red Stripe Weevil (*Rhynchophorus*)
*Brachartona catoxantha**
*Plesispa Reichei**

PESTS AND DISEASES OF PADI.

Podops
*Nezara**
*Leptocorisa**

MISCELLANEOUS PESTS.

White Ants
Malayan Locust
Cotton Stainer (*Dysdercus cingulatus*)
*Atlas moth** (*Attacus atlas*)
Daphnis hypothous (*pest of cinchona*)

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* Nearing completion.

ENTOMOLOGICAL NOTES.

During the first quarter of 1921 detailed investigations of the following insects were in progress.

Pests of Sugar Cane—

(i) Mealy Bug;

(ii) A weevil borer, probably *Trochorrhepalus* sp.;

(iii) *Scirpophaga monostigma, Zeller*—A Pyralid moth borer.

Pests of Padi—

(i) *Podops coarctata F.*—A sucking bug;

(ii) *Sesamia inferens, Wlk.*—A noctuid moth borer;

(iii) *Schoenobius bipunctifer, Wlk.*—Pyralid moth borer;

Pests of Coconuts—

(i) *Rhynchophorus, Oliv,* Red stripe weevil borer;

(ii) *Oryctes rhinoceros, Linn,* Rhinoceros beetle;

(iii) *Plesispa reichei, Chap.*—A Hispid beetle.

(2) Observations concerning a number of other insects have been made: the principal being—

(*a*) *Tiracola plagista Wlk.*—The caterpillars of this moth devour the leaves of Castor;

(*b*) *Margaronia marginata, Hamps.*—The leaf roller of cinchona;

(*c*) *Prodenia litura, Fab.*—A Noctuid moth. The caterpillars of this insect feed on most plants.

PADI.

At the Titi Serong rice station, Krian, work has proceeded chiefly with the checking and recording of the vegetative and flowering characters of the different varieties and of lines of Sa' raup, Radin and Pahit. A few of the earlier varieties were reaped towards the end of March.

The Pekan, Pahang, padi experimental station has just concluded its fourth year of tests on dry land padi. Thirty-five varieties are under test at this station. Other work consists of experiments on cultivation and catch crops.

An exhaustive test is to be made of the Fordson Tractor for cultivation of this class of padi.

SUPPLY OF PADI SEED FOR PLANTING PURPOSES.

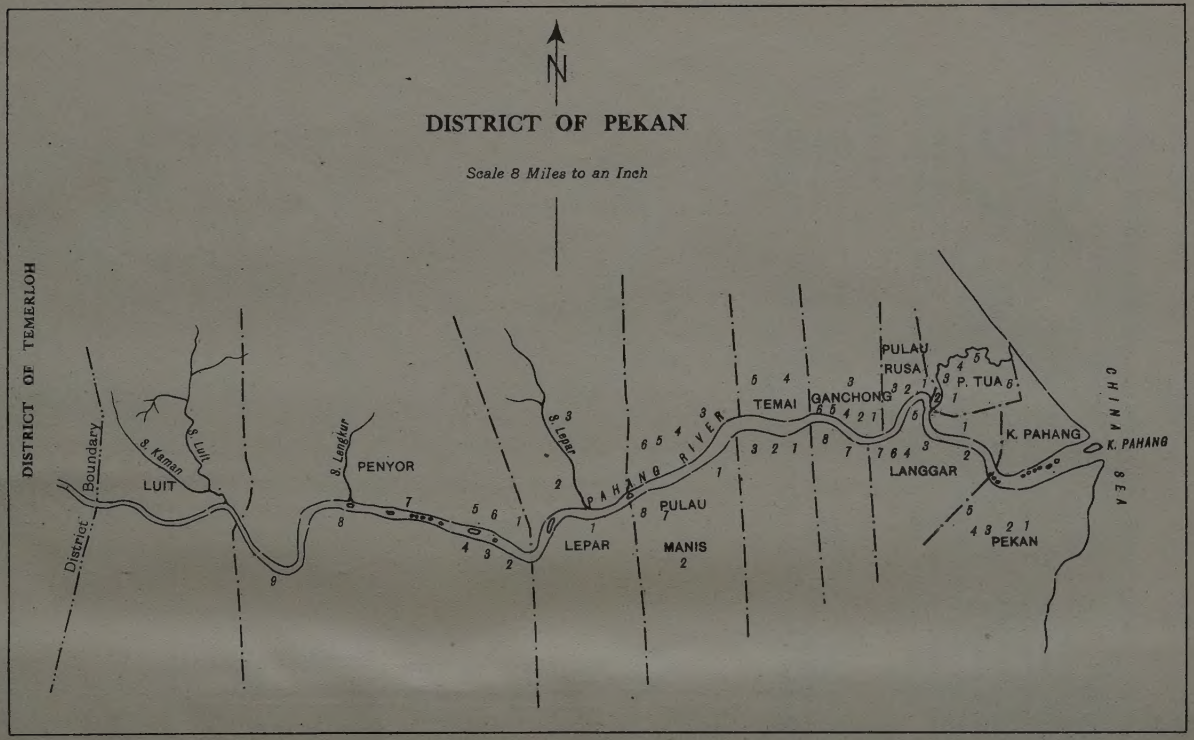
With the improvement in the supply of rice, the demand for foodstuff planting material has gradually fallen off and, in consequence, the arrangement made with the Planters' Stores and Agency Co. Ltd., Klang, for the distribution of seeds of the various food crops, was cancelled at the end of March and, in future, the distribution will be undertaken by this Department.

CASTOR, GINGELLI (SESAMUM) AND GROUNDNUT OILS.

Messrs. Durège and Thomas Ltd., 8, Beach Road, Penang, inform us of signs of a renewal of the oil milling industry in the Straits Settlements. During the war, the Penang mills were supplied with groundnuts from Burma, but this source of supply being no longer available, there should be a good opportunity of finding a market for locally grown oil seeds. It is probable that, with regular supplies of raw material, the demand will set in. Readers interested in oil seeds are invited to correspond with the above firm who will endeavour to effect a sale of their products.

TRACTORS.

The Director will be glad to receive reports from Managers who have cultivated their estates with tractors, as the department is endeavouring to collect data on comparative costs and efficiency of the different types of machine.


N
DISTRICT OF PEKAN
Scale 8 Miles to an Inch
DISTRICT OF TEMERLOH
District Boundary
S. Luit
S. Kaman
LUIT
S. Langkur
PENYOR
S. Lepar
PAHANG RIVER
LEPAR
PULAU MANIS
TEMAI
GANCHONG
PULAU RUSA
P. TUA
K. PAHANG
LANGGAR
PEKAN
K. PAHANG
CHINA SEA

THE CULTIVATION OF TENGGALA PADI.

By D. H. Grist and Syed Abdul Rahman.

THE word "tenggala" means "plough," and the cultivation of padi, which has ultimately become termed "padi tenggala," was in the first place designed to differentiate the system from the usual method of cultivating dry padi, "padi humur," and from the various systems of planting wet padi such as "padi paya," "padi lanyak" etc.

The tenggala system of padi cultivation is the most effective means of growing the crop that has been seen in these States. The climatic conditions peculiar to Pahang (with a very definite monsoon season) have given rise to varieties of padi particular to this method of padi cultivation. It is doubtful whether tenggala padi cultivation is very long-established in this country. Had such been the case, it is probable that the varieties of padi grown at the present time under this system would have become more numerous than they are, and the quality of the seed might reasonably have been expected to be better than is the case. Tenggala padi has certainly existed along the banks of the Pahang River for many years, but it is only in more recent years that the population has been sufficiently settled to make any real advancement in the padi cultivation of the State.

The "tenggala" padi system is important, not so much on account of the area under cultivation at the present time, but because it constitutes the most scientific and complete system possessed by the Malays, and because the expansion of the system, both in Pahang and in other States appears both desirable and possible, and may prove an alternative system to be adopted in other centres where the cultivation of wet padi or of "padi humur" is impracticable.

The system of "tenggala" padi cultivation is one in which the land is subject to a period of cropping, followed by a period of fallow. It has been found from experience (by Malays) that the land is incapable of bearing more than four successive crops of padi: so that the custom is to crop the land four times and then to fallow from four to six years. During the period of fallow, the land reverts to grass-land, or secondary jungle, or a mixture of both, and the fields then become the grazing ground for

buffaloes. If one considers the period of fallow as of four years, and the period of cropping as four years, it is evident that the total crop removed from the soil is about 600 gantangs (or less) over a period of eight years. Is the system wrong, or do other factors enter into the problem? The following account of the system, of the varieties, and of the experimental work carried out by the Federated Malay States Department of Agriculture may help to form an opinion on this matter.

Preparation of Land.

The secondary jungle is cut down and removed. All stumps and wood are extracted and burnt. The land can then take a plough without danger to the implement. The soil is ploughed to a depth of about two to three inches with a wooden plough. This first ploughing is known in Malay as "membelah." Ploughing is done on the "stetch" system, in very much the same way as is the case with a horse plough in England. Should the field have been newly opened after a period of fallow, an interval of about one month is allowed to elapse between the first and the second ploughing: this is in order that the soil be given sufficient time to "weather," and to permit the grass thus turned under to rot. In the case of annual cultivation, the second ploughing follows closely after the conclusion of "membelah." The second ploughing, which is cross-ploughing, is known as "mengrat." The third ploughing, following the same direction as "membelah" is known as "melapis." After these three ploughings, the field is raked once with a long rake ("sikat") drawn by one buffalo. The plough is drawn by a pair of buffalo or oxen. The field is now ready for the sowing of the seed.

Sowing.

Seed padi is steeped in water (sometimes in a weak solution of common salt), and only the seeds which sink are retained for planting purposes. Thus the Malay ensures that his seed shall be "heavy"; it is a system of seed selection. The seed thus selected, and while still wet, is retained in a cool place for one day and night, and then broadcasted over the land. The Malays employ about ten gantangs of seed per acre in sowing their field with tenggala padi. The padi grows thickly, and they judge that weeding is thus rendered unnecessary. In the padi experiments, seven gantangs of seed per acre was sown, and this caused no diminution of yield, the plants growing more strongly and producing more tillers. In sowing the padi, the land is divided into narrow strips, about six yards wide. This is done merely to assist in the even distribution of the seed over the area. (The operation is known as "membuat a' awat.") After broadcasting ("tabor,") the seed is covered by a single ploughing, or by raking. Little in the matter of after cultivation is attempted. Should weeds be numerous, the land may be weeded about six or eight weeks after planting, for which purpose a very short handled hoe (kiut") is used.

Harvesting.

Harvesting padi, where the growth of the crop and the ripening are both even, is done with a sickle ("sabit,") the plants being cut off a few inches above the collar. Where ripening is uneven, or if harvesting takes place when floods are over the land, the crop is harvested with the "tuai," a small native-made knife of about two inches in length mounted on a flat piece of wood. The "tuai" slightly resembles in shape a bird in flight, and it is in fact, with this idea, that the mounting takes the form it does. The "tuai" is held in the right hand, so that the blade is in the palm of the hand. The ears of padi are cut from the stems, one at a time. It may be imagined that this is laborious method of harvesting fields of grain. The one great advantage of this method of harvesting is that only ripe grain is reaped; and in cases where the padi destined for seed purposes in the coming season is harvested before the main crop, some amount of selective work is possible.

Cleaning Padi.

When padi is harvested with the sickle, bunches of the plants, held at the lower end, are beaten against the inside of a wide mouthed tub. The seed is thereby shaken from the ears. Where the "tuai" has been employed, women trample on the ears of padi, and thus separate the grain (padi) from the stalk.

Padi then has to be winnowed. About one quarter of a gantang of padi is placed on a tray of split bamboo or "menkuang," and by a continual shaking and tossing motion, the worker brings the empty grains and light rubbish to the lip of the tray. By a dexterous twist of the wrist, the rubbish is shaken off the tray. The tray and contents are then held over the head, the worker standing on the edge of a mat. The padi is shaken off the tray so that the empty grain and other débris fall to the ground, while the good seed falls on the mat.

The Milling of Padi.

The methods used in "kampongs" for the milling of padi have been described in detail elsewhere.* Similar methods are used in Pahang. The usual instrument employed is the "lessong," by which a mortar and pestle action is brought to bear on the padi.

After the removal of the padi, the land remains fallow until the following season. No attempt has yet been made by the natives in the utilization of tenggala land for the cultivation of crops other than padi, with the exception of maize, which is sometimes sown with the padi seed.

It only remains to point out that tenggala padi cultivation in Pahang is entirely in the hands of the Malays. The land is held under grants at a rental of sixty cents an acre, or on temporary licence at $1 per acre, so that when the time comes for a period of fallow, the land is surrendered to Government.

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*Padi Planting in Negri Sembilan.

TABLE 1.

TENGGALA PADI AREAS IN THE PEKAN DISTRICT OF PAHANG.

Key to Map of Pekan District.

Mukim.	Locality.	Ref No. on map.	Area planted in 1919.	Area total.
Penyor ...	Tanjong Chempaka	1	*nil*	180
	Penyor Kiri ...	4		
	Sepaku	2		
	Membang	3		
	Penyor Kanan ...	5	30	60
	Buntot Pulau ...	6		
	Obah Penyor ...	7	20	100
	Sungei Duri ...	8		
	Bintang	9		
Lepar ...	Tanjong Gajah Mati	1	15	115
	Pelak	2	30	180
	Dalam Lepar ...	3		
Pulau Manis	Seberang P. Manis	1	40	190
	Padang Jarau ...	2		
	Pulau Manis ...	3	60	610
	Tanjong Medang Bahru	4		
	„ Pulai ...	5		
	Kenal	6		
	Pulau Rumput ...	7	45	195
	Serambi	8		
Temai ...	Temai Hilir ...	1	100	250
	„ Ulu ...	2	60	210
	Tanjong Penyangat	3		
	Mentawan ...	4	*nil*	300
	Padang Chekor ...	5		
Ganchong ...	Tanjong Batu ...	1	120	220
	Keyambong ...	2	30	130
	Jerau	3	50	150
	Ganchong Kanan	4		
	Telok Malin Baya	5	50	100
	Lanjot	6		
	Kuala Ganchong and Kubang Buaya...	7	60	160
	Blukar Achih ...	8	70	170
Pulau Rusa	Telok	1	35	135
	Pulau Rusa ...	2	150	350
	Padang Lalang ...	3		
Pahang Tua	Pahang Tua ...	1	100	200
	Sebrang Pahang Tua	2	60	140
	Gembuang ...	3	75	175
	Lamir	4	30	230
	Kerayong	5		
	Sawah	6		

Mukim.	Locality.	Ref No. on map.	Area planted in 1919.	Area total.
Langgar ...	Langgar	1	50	150
	Tanjong Medangsa	2	50	250
	Tambang	2		
	Bawang	2		
	Pulau Keladi ...	2		
	Kemah Hang ...	3	200	250
	Pasir Tanjong ...	5		
	Tanjong Medang ...	4	150	175
	Seker	6		
	Aux Gading ...	7	65	125
Pekan ...	Ketapang	1	20	100
	Ulu Parit & Ayer Hitam	2	25	65
	Pekan Lama ...	3	100	200
	Padang Buloh ...	4	90	190
	Sungei Mat Dulong	5	20	70

These figures are estimated. No accurate records exist. The total padi tenggala area is therefore just over six thousand acres in the Pekan district, of which 2000 acres were cultivated in 1919. This is a large proportion, due no doubt to the difficulty in obtaining rice, and to the enhanced price of the commodity.

Climate and Soil Conditions.

In order that a clear conception may be gathered of the usual conditions under which padi may be grown on the "tenggala" system, and that the cultivation of the crop in other districts may be considered by the individual, it is necessary that a full description of climatic and soil conditions be understood, both on the areas now under this crop, and of the land on which it may be proposed to commence its cultivation.

Climate.

The whole of the valley of the Pahang River is subject to the effects of the North East monsoon. This occurs from about December to March. The monsoon brings with it a tremendous amount of rain. (*See* Table II.) The Pahang River then rises above its banks, and the majority of the tenggala land is flooded. The possibility of the influence of flooding of tenggala land must be considered. Does it, like the Nile, improve the condition of the land? The Pahang River brings down a large quantity of silt from the tin mining centres situated in the interior, and no doubt, some of this silt settles on the land. To some extent this may influence the quality of the soil, but it is thought that it improves the soil only to a restricted extent, and that, mechanically rather than chemically. By the following table it will be seen that the planting season follows the monsoon. That is to say, the ideal time for planting is held by the Malays to be while rains are frequent and the ground wet, but not so that the padi stands in water. It should however be mentioned that tenggala padi is capable of withstanding flood during any period of its growth.

Table 2.

Average Rainfall in Pahang.

Place.	Period.	Jan.	Feb.	Mar.	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.	Total.
Kuala Lipis ...	1904–1918	8.77	4.46	5.44	6.88	8.70	8.01	6.21	6.99	7.39	10.36	10.87	10.24	94.32
Raub	,,	9.08	5.50	5.26	6.34	5.53	5.35	4.25	6.00	7.19	8.56	11.41	9.13	83.60
Bentong... ...	,,	9.53	5.54	8.12	7.08	6.49	6.83	4.28	5.85	5.98	9.76	11.94	12.07	93.47
Pekan	,,	17.14	10.15	6.93	6.29	7.03	4.90	4.91	6.84	7.51	10.03	15.12	29.46	126.31
Kuantan ...	,,	12.73	6.52	6.16	5.75	6.00	5.28	6.32	6.30	6.75	10.11	13.82	25.81	111.55
Temerloh ...	1913–1918	9.32	4.51	7.34	7.53	8.58	3.25	4.02	7.27	5.05	7.82	8.86	9.46	83.01
Sungei Lembing	1915–1918	12.80	4.87	11.64	9.91	11.75	5.20	6.40	11.18	8.59	10.05	17.86	18.42	128.67
Kuala Tembeling	,,	9.43	2.89	7.78	7.94	6.34	6.55	5.75	6.84	6.30	8.69	8.06	9.56	86.13

(Table abstracted from the "Manual of Statistics" relating to the Federated Malay States, 1919.)

The chief centres of tenggala padi cultivation are in the Pekan and the Kuala Lipis districts. In the latter district, which is some one hundred and fifty miles from the coast, the rainfall is more even, and the heavy rains of the monsoon less felt. It should be possible therefore to cultivate padi over a wider range of months in this district than in the Pekan district. The padi tenggala planting dates in the following table are those laid down by Government and published in the *Government Gazette*.

TABLE 3.

Date for the Cultivation of Tenggala rice for the District of Pekan for the year 1920.

Operation.	Pekan.
(*a*) Begin ploughing	1st March, 1920
(*b*) Complete ploughing	15th May, 1920
(*c*) Begin sowing	16th May, 1920
(*d*) Complete sowing and fencing	14th June, 1920
(*e*) Begin weeding	2nd July, 1920
(*f*) Complete weeding	17th August, 1920

The main padi tenggala varieties are of a six months' maturation period, so that, supposing the planting is done to time, and frequently the Malays are late in their planting,—the crop has to be harvested in November or December, *i.e.*, during the rainy months. The writers are unconvinced therefore, as to whether the planting of padi tenggala is in accordance with the most favourable season. Until it is possible for investigations to be made on the extent and periods of flooding of tenggala land, and trials conducted on the question of planting in different seasons, no attempt can or should be made by a mere theorist to alter the accepted dates for planting this crop.

SOIL CONDITIONS.

A complete investigation of the chemical and mechanical conditions of tenggala padi land has never been undertaken. The writers have been able to discover only a few analyses of samples of tenggala soil collected by Mr. J. Grantham from various tenggala fields in the Pekan district. Whether these samples agree in composition with the soils of the Kuala Lipis district is doubtful. The range of soils suitable for padi tenggala cannot be stated. The analyses in table 4, were made by the Chemical Division of the Agricultural Department F.M.S.

TABLE 4.

Chemical Analyses of "Tenggala" Padi Soils.

Ref. No.	Langet.	Tanjong Batu.	Pulau Rusa.	Pahang Tua.	Langgar.	Tambang.	Pekan Expt: Plot:	
							1916.	1917.
Moisture	2.6	2.2	2.7	2.9	3.5	3.5	2.8	3,6
Loss on heating	9.4	9.7	10.0	10.2	11.4	16.5	9.6	9.4
Potash (K_2O)	0.39	0.42	0.42	0.52	0.58	0.47	0.46	0.43
Phosphates (P_2O_5)	0.11	0.10	0.13	0.08	0.07	0.11	0.09	0.05
Insoluble in HCL.	72.0	72.0	70.	78.	73.	64.	72.	72.3
Nitrogen (N).	0.12	0.13	0.11	0.12	0.16	0.35	0.10	0.17
Lime requirement (Tons per acre)	2	$2\frac{1}{4}$	3	5	$3\frac{1}{4}$	3	...	$2\frac{1}{4}$

Reporting on the soil from the Pekan padi experiment ground, 1917, the Agricultural Chemist F.M.S. states "The amounts of potash and nitrogen in the soil are fair, although the nitrogen is low compared with many good soils in this country. The phosphoric acid is low, like many soils in Malaya. Mechanically the soil is very good, consisting of well-balanced proportions of fine sand, silt and clay, and should be suitable as a "tenggala" padi soil."

Now, the removal of a crop of padi, supposing the yield per acre to be 200 gantangs and the straw allowed to remain on the land, depletes the soil of the following amounts of substances necessary for crop growth:—Nitrogen 14.7 lbs. per acre, phosphates 3.92 lbs., and potash 3.8 lbs. per acre. Unless steps are taken to return to the land some of this lost fertility, assuredly the land must ultimately be exhausted, although it will always yield a certain "minimum crop." This crop will be found to be so low, as has obviously been found to be the case by Malays, that the cultivation of land after about four years of cropping does not give an adequate return for the expense of cultivation.

The improvement of the tenggala padi cultivation in Pahang must therefore proceed along three lines:

(*a*) Improvement of the varieties of padi cultivated;

(*b*) Manuring or other means for the rejuvenation of the land;

(*c*) Improvements in cultural implements, in cost of production, and in the effectiveness of the cultivation.

Up to the present time it has been the aim of the investigators to prove the cropping capacity of the soil, to improve the culture of the crop and, although the manuring of padi with artificial manures has not been undertaken by them, to study the system of catch crops for replenishing the soil's supply of nitrogen. This, in conjunction with the data obtained of the amounts of crop that can be obtained under varying conditions, gives a sound basis on which to commence work on the manuring of the land.

Catch Crops and Cover Crops.

For rotation with padi "Tenggala."

The system under which padi tenggala is grown proves exhausting to the soil. It is customary to crop the land about four times and then to allow it to become the grazing ground for buffaloes, lying in this fallowed condition for a number of years, the average length of time being about four or five years. Thus, of the total area nominally cultivated with tenggala padi, only a quarter is cultivated in any one year. A great deal of the land is held by the Malays on temporary

licence, so that when the land is fallowed no rent is paid, and the land reverts to Government. With a steady demand for rice and, with the urgent necessity of producing larger crops in districts in which this crop is capable of cultivation, a rotation of crops on such land becomes highly desirable. The advantages of such rotations are fully recognised in other countries, but, as far as this country is concerned, little has been attempted in this direction either by Malays or Europeans. The obvious advantages of rotations may be stated shortly as follows:

(*a*) Restoring the fertility of the soil with regard to its nitrogen content. This may be done by the cultivation of leguminous crops, which have the power, by virtue of the nitrifying bacteria on their roots, of assimulating the free nitrogen of the air and leaving this nitrogen in a more soluble (and available) condition in the soil, thus becoming plant food for subsequent crops;

(*b*) Increasing the total production of foodstuffs in the country.

(*c*) Providing increased production of cattle foods. As is discussed elsewhere, the foodstuffs for the buffaloes of the Pekan district are decidedly scanty during the monsoon season, and a number of young cattle die annually from insufficient or bad food. Remembering that for some years the Pekan district has supplied a considerable number of buffaloes for export to other States, the increased production of fodder and rich foods would react beneficially on the prosperity of the district;

(*d*) The interchange of crops on land makes full use of the various resources of the soil. Land cannot be cropped continually with the same variety of plant, as it becomes depleted of particular types of plant material (according to the plant grown);

(*e*) The mechanical condition of a soil improves with cultivation. Land which becomes "out of heart" through insufficient cultivation produces but poor crops. It is for this reason that newly opened tenggala land frequently produces poorer crops in the first year of cropping.

Crops which are to answer the purpose of rotation with padi in the "tenggala" districts must indeed be of a somewhat hardy nature. In the tests that have been made it is frequently observed that the acclimitization of the stock takes two or three years. It is probable that even more favourable results follow from the further cultivation of stock introduced into the district. It must be remembered that tenggala land is liable to flood, in particular during the monsoon season, and crops must therefore

be hardy enough to withstand flood, or they must reach maturity before the wet season sets in. It is therefore somewhat difficult to arrange the most advantageous season for planting the crop; for, should the wet season be entirely lost, a number of the plants will fail to grow through insufficient rain.

With these preliminary remarks, an account of the cultivation of various crops will be described. In all cases the crops have been tested on the Pekan Experimental Grounds.

Cassia Occidentalis. (Nigger Coffee). From India.

The seed was broadcasted on thrice ploughed land on 24th July, 1917, and raked in. The germination and growth were very good. The first flowers were noted on 12th January, 1918, but seed did not set until the end of the monsoon in March 1918. The plants withstood the wet weather of 1917-18 and made further progress during the subsequent dry season. Nitrifying nodules were found in fair quantity.

Nigger coffee is used in parts of India as a substitute for the coffee of commerce. Malays of Pekan have prepared coffee from the Cassia, but it is unlikely to attain any popularity. The crop, although a success from the point of view of a "cover," cannot be considered likely to achieve any other use in Pahang. In two years it had grown to a plant of about six feet in height, and become very woody. It was therefore removed, and a new planting made.

Canavalia Ensiformis. (Sword bean, "Kachang Parang.")

1917.—Dibbled on land cleaned of scrub on 30th July 1917, but failed to germinate. A further trial made, of which ten plants matured. A small quantity of seed obtained before the crop was destroyed by the monsoon. The canavalia seed from a small crop obtained in 1916 was planted on 30th July, 1917. The growth was good, and yielded 5 lbs. of seed. This was a plant of erect growth, whereas the usual variety of *canavalia ensiformis* is of a creeping nature.

1918.—Stock obtained from the above was planted in this year (16th April, 1918), on land that had been cropped previously with padi. The size of the plot was 3,890 sq. lks. The crop obtained was at the rate of 480 lbs. per acre.

1919.—Seed from last year's experiments dibbled on 12th April, 1919, on a new clearing that was twice ploughed. Flowered 2nd June, 1919, and a crop obtained at the rate of 810 lbs. per acre. A second fruiting in the same year was destroyed in the monsoon in December.

Centrosema Plumerii.

Centrosema was first planted at Pekan by the writers on a small plot of land in 1916. The crop on this occasion grew very well, and although the ground was abandoned later, yet the patch of centrosema remained for three years. An examination of this plot was made during the monsoon of 1917, when it was found that, in spite of the fact that the land was flooded at the time, nitrifying nodules were very numerous.

1917.—Seed obtained from the above was again planted this year, the growth being strong. A second source of seed was tried, obtained from the Government Plantation at Kuala Tembeling. This also produced a good cover in a short time. It was found that the nitrifying nodules on the stock obtained from the latter source were more numerous than from the former seed.

Centrosema was grown on the rotation experiment plot in 1918. For result see the description of this experiment.

1919.—Seed from the Kuala Tembeling stock was again planted in this year, with good results.

Centrosema is one of the most successful crops grown on the Pekan experimental ground. With good preliminary cultivation, the growth is excellent, and a cover is formed very rapidly. The result of planting this crop must be of great benefit to the soil. Unfortunately, cattle will not feed on centrosema, so that it can only be used as a cover crop. In withstanding the floods of the monsoon season, its value is enhanced. Its use throughout the district is never likely to be great, as the native is bound to look for a crop which can be fed to buffaloes or be of use to man.

Siam Beans.

A few seeds of a bean, known in Singapore market as the Siam bean were obtained. It is an edible cluster bean, (*cyamopsis pseraliodes*). Eighteen seeds only were planted, of which 15 germinated. Planted 24th July, 1917, flowering noted 19th October, 1917. Eventually, forty-two katis of seed were harvested.

A small plot of this bean was planted in 1918, and the yield was heavy.

The crops obtained have been so heavy that it has been determined to grow them on a larger scale in the next season. The plant is of climbing habit, much liked by Chinese and Malays, and produces clusters of nitrifying nodules.

Castor Oil.

This crop has been grown experimentally at Pekan since 1917. It can be planted at any time of the year, and once established, will withstand flooding. The local demand is small, and it is doubtful whether its growth is advantageous to the soil.

YAMS.

Yams were introduced in the Pekan experiments in 1917. A somewhat extensive trial was made of them in that year, but the available supply being small, the experiment was of necessity inconclusive as regards yields. The following is the result of the 1917 trials.

TABLE 5.

Record of Yams grown at Pekan, year 1917.

Ref. No.	Number planted.	Number growing.	Date of first shoot.	Weight of yams obtained. K	T	Remarks.
71/17	8	7	30. 9.17	18	8	One plant eaten by pigs
72/17	6	6	21. 9.17	16	12	
73/17	5	3	8.10.17	0	9	
74/17	6	Did not grow.				
75/17	6	5	4.10.17	4	0	One plant eaten by pigs
76/17	8	7	27. 9.17	8	3	Two plants „
77/17	8	6	27. 9.17	13	12	One plant „
78/17	5	2	14.10.17	0	12	One „ „
79/17	4	2	30. 9.17	1	13	

From stock obtained from the above, planting was made in 1918, but the attacks of pig destroyed the entire crop. It is an undoubted fact that yams will grow on this class of soil, but it is useless attempting to do so in districts near jungle, owing to the ravages of wild pigs.

MAIZE.

Maize trials were conducted in 1919, and the success attending these tests has decided the experimenters to extend the scope of the work on this crop at Pekan.

It is not an unusual occurence to see maize growing amongst "tenggala" padi. The system in this case is to sow the padi and maize at the same time, so that the latter is ripe and harvested some time before the padi comes into flower. Maize is also grown along the banks of the Pahang River and on the islands in the river. The crops obtained are consumed locally.

In the following experiments, the maize was cultivated on "tenggala" land from which no crop of padi had been removed for some years. The land was ploughed three times, and the seed dibbled in two seeds per hole. The record of growth and crop is given below.

TABLE 6.

Maize Trials. Growth and Crop.

Variety.	Size plot square links.	Date of planting.	Date of flowering.	Date of harvest.	Ultimate height.	Crop obtained.	Estimated yield per acre.
					ins.	lbs.	lbs.
Indian	12,500	5-4-19	10-5-19	23-6-19	41½	38½	308
White	5,000	9-4-19	10-5-19	23-6-19	40	31½	630
"Johore" ...	22,500	10-4-19	11-5-19	26-6-19	41	213¼	948
"Pahang" ...	10,000	10-4-19	14-5-19	29-6-19	40	76½	765

RAGI. (*Elcusine coracana*).

The first trials with this crop were made in 1918 on the Pekan plots. The seed was sown on odd strips of land, as no provision had been made for its reception in the years' work. The plants made good growth, and produced much seed.

In 1919 a more extended trial was made. The seed was sown in the nursery on 22nd January, 1919, transplanted on thrice ploughed land on 22nd February, 1919, flowered 3rd April, 1919. The crop was destroyed by birds and wild pig.

A crop grown on similar land in the same district gave a yield of about 100 gantangs per acre.

Ragi should do fairly well on tenggala land, provided that the planting is carried out immediately after the monsoon. Amongst Malays it is unpopular, and the Tamil population in the district is very small.

ITALIAN MILLET. (*Seteria italica*).

An attempt was made to grow this crop in 1918, but the season was too late. In 1919 it was again planted, but only a few plants reached maturity.

AFRICAN MILLET. (Seed obtained from Africa by the late G. M. Laidlaw, Esq.)

This variety grew strongly, but the crop was entirely destroyed by pigs, a few heads only being saved. The opinion is expressed that millet is suitable for cultivation in Pekan, but that, being very liable to the attack of pigs (and birds), it cannot be cultivated near jungle.

PIGEON PEAS. (*Cajanus indicus.*)

Pigeon peas have been grown three times, but although the growth has been satisfactory, on every occasion the flowers were attacked by insects, so that no crop was obtained.

JOB'S TEARS. (*Coix Lacryma-Jobi*) Malay: Menjelai.

The variety with a hard husk (known to the Malays as Menjelai batu) was obtained from the Agricultural Department at Kuala Lumpur, and cultivated at Pekan in 1919. A few seeds only were planted, and the crop obtained was satisfactory.

Seed from Bebar (Pahang) was planted in the same year. The land was thrice ploughed, and once harrowed. The seed was dibbled in eighteen inches apart, five seeds per hole, on 17th April, 1919. The growth was very strong. Flowering noted on 12th August, 1919, and the crop harvested on 25th October, 1919.

Size of plot 9,520 sq. links. From this plot five gantangs of unhusked grain were harvested, giving an estimated yield of fifty-two gantangs per acre. This is poor, but there appear to be no available figures to prove the normal yields for this crop in Pahang. A further trial is to be made in 1920.

The hard-husked variety is less popular with Malays than the thin-husked variety. The crop appears capable of improvement, and would be a useful addition to a rotation of crops on tenggala land.

A Japanese red coloured bean, obtained from the Singapore market, was tested on a small scale in 1919. The land received the usual cultivation, and 1½ lbs. of the seed were planted in rows one foot apart on 25th July 1919. Germination was very rapid (there was a good deal of rain about this time); flowering noted 18th August, 1919, and the crop harvested on 25th September, 1919, six lbs. of seed being obtained.

The result of this small test is extremely promising. The crop was obtained two months after planting. The plant is of an erect habit, growing to a height of about eighteen inches. The bean is eaten by Chinese especially, but also by Malays. Its value is therefore undoubted. A larger plot of this bean is to be grown in the next season. As a cover it is useless, but it is of great value as a catch crop.

The experiments towards the introduction of new crops has thus made some advance in the last three years. The results are summarised below.

TABLE 7.

Results of work on introduction of rotation crops for "tenggala" padi land, Pahang.

Crop.	Utility.
Maize.	Rotation crop, edible. Exhausting to soil.
Sword Bean.... ...	Rotation crop, edible. Improves soil. Can be also used as a green manure if planted thickly and ploughed in before maturity.
Siam Bean	Rotation crop, edible. Owing to heavy crops probably somewhat exhausting to soil. ... ...
Job's Tears.	Rotation crop, edible. Crop small ...
Japanese Bean. ...	Rotation or catch crop. Edible ... ...
Nigger Coffee. ...	Rotation crop, not edible. ... ...
Indigo.	Green manure crop, little demand for dye.
Centrosema.	Rotation or cover crop, greatly benefits the soil. Plough in as green manure. Not edible... ... ...

(*To be continued.*)

THE POSSIBILITIES OF DEVELOPING ROSELLE FIBRE AS A COTTAGE OR OTHER INDUSTRY IN THE F.M.S.

By F. W. South.

Hibiscus Sabdariffa is an annual shrub cultivated in most tropical countries; it is a relative of the cotton plant. There are two varieties, *H. Sabdariffa* var. *Victor* and *H. Sabdariffa* var. *Altissima*. The *Victor* variety is grown successfully here by Tamil coolies as a vegetable and also provides a good jam or jelly from the fleshy sepals. The *Altissima* variety is the plant from which fibre has been obtained. There are two races of this variety one red and one green, both yield fibre.

So far only preliminary small scale experiments with Roselle fibre have been conducted by Mr. Mathieu at Kuala Kangsar. The work is in an early stage and no data are yet available upon which to base an estimate of the costs of production, the market price of the fibre or the probable profit per acre. Work is in progress to determine these and other points, but it will be some considerable time before results are available, on account of the shortage of seed.

The present position is, however, summarised below, and some general remarks are added, based on analogy with cotton cultivation.

A.—Points arising from Mr. Mathieu's Small Scale Experiments.

1. When grown by an experienced man the variety *Altissima* does well in this country so far as can be judged by small scale experiments.

2. The lateral branches when cut at the right age, that is, when the plants are just commencing to flower and when the branches should be over four feet in length, yield, by a very simple process of retting in stagnant or slowly moving water for eight or nine days, a fibre favourably reported on by Professor Dunstan of the Imperial Institute.

3. The fibre is suitable for spinning; its general appearance is good and its special feature is the length of its staple, which may be as much as four feet.

4. If the branches are cut when too old, the fibre is found to be matted and of inferior quality in consequence.

5. The fibre from the main stem is of inferior colour and apearance, while the staple is shorter on account of the breaking of individual fibres at the points where the lateral branches emerge. This fibre is of very inferior quality.

6. The plants seeds fairly freely, but the seed pods are attacked to some extent, even on the small plots, by the cotton stainer, *Dysdercus* sp., which has caused a small loss of seed. By analogy with what has occurred on cotton in the West Indies it seems probable that, if the plant were grown on a large scale, this pest would develop to such an extent as to reduce materially the yield of seed. Other pests and diseases must almost certainly be expected to appear in time and to require careful routine treatment as they do in the case of cotton.

7. As the branches of fibre yielding plants have to be cut before flowering, special areas would have to be grown as a source of seed supply.

B.—Points requiring further investigation.

1. The cheapest method of establishing the plants in the field. Mr. Mathieu germinated his seeds in wet sacking, transferred them to a small seed bed, from which he again transplanted the seedlings in a larger bed, and finally removed the young plants to their permanent position. This method is too elaborate and expensive for use on a practical scale. The seed is too small to plant three or four seeds in a hole as is done with cotton. An alternative simple method must be worked out.

2. On Mr. Mathieu's plots the plants have been watered twice a day. It is important to determine whether the plants will thrive without artificial watering. The necessity for this would restrict the area suitable for the crop. There are indications on the nursery at Serdang that irrigation will not be necessary and these are supported by the nature of the plant itself.

3. Practically the entire method of cultivation requires to be worked out, involving preparation of the land, planting, planting distances, up-keep, manuring and rotation.

4. The costs for these operations and for harvesting require to be worked out on a reasonably large scale, and the value of, and market for the fibre to be determined.

5. A comparison is required between the fibres from the green and the red races.

C.—Work in hand.

1. Experiments on a small scale have been started at Kuala Kangsar to determine the best planting distances for both the red and the green variety.

2. Small samples of fibre from each race should be obtainable at Kuala Kangsar for comparison.

3. Beds are being maintained at Kuala Kangsar to provide a supply of seed. Seed has been sent to Batu Tiga, Kuala Lumpur, and Gunong Angsi plantations. At Batu Tiga one acre is set aside for this crop, while on the other two plantations, only small plots are being planted. All these will serve as sources of seed.

4. The plots at Batu Tiga, Kuala Lumpur and Gunong Angsi will also serve to test the growth of Roselle on different soils and at a different elevation.

5. At Serdang, an area of 15 acres has been set aside for this crop and nurseries have already been started there for planting up 5 acres. The nurseries are doing well. As seed becomes available from Kuala Kangsar more nurseries will be started. The first object of this work is to obtain a large supply of seed of both the red and the green races. Subsequently both varieties will be planted up on a scale sufficiently large to afford figures of costs, and to give a large sample of at least a few tons of fibre from each race to be tested in England.

D.—General considerations.

If the results of the experiments show that this crop can be grown successfully and will command a reliable market at a price yielding a reasonable profit per acre, the following points have to be considered:

1. The simplicity of the preparation of the fibre is a point in favour of the crop, especially as a "cottage" industry.

2. To maintain the quality of the crop from small holdings and to enable it to be baled for cheap transport, central purchasing stations, provided with facilities for grading and baling would have to be established in producing districts.

3. Such stations would require to be in a position to make purchases for cash as do the rice mills in Krian. The preliminary purchase might perhaps be followed by a sharing of the profits, if any.

4. There are three points which tell considerably against this plant as a "cottage" industry.

(*a*) It would require sound agricultural methods and continuous care for success, such as do cotton and, in fact, all annual crops.

(*b*) The branches have to be cut when between 3 and 3½ months old. If left till about 4 months old they flower and fruit and the quality of the fibre is much impaired. There would thus have to be a definite harvest time and the grower could not suit himself as to when he would reap. With Manila hemp, for example, the period during which it can be harvested is much longer.

(*c*) As seed plants yield poor quality fibre, either a little plot would have to be maintained for seed on each holding, or the Government would have to supply seed for planting. There would be a temptation to mix poor quality fibre from the branches of seed plants, as well as from the stem, with samples of good quality. This emphasises the need for careful grading referred to above. A supply of selected Government seed and careful inspection at the buying centres might overcome this difficulty. If improved varieties are developed, a supply of Government seed would be most desirable.

5. Apart from rice, the majority of Malay small holders in this country are not accustomed to cultivate annual crops requiring elaborate agricultural methods and continuous care for their successful growth; they mainly depend on permanent or orchard crops; they have very little agricultural instinct or tradition. I am, therefore, of the opinion that Malays would not of themselves readily take up this crop, unless the profits proved to be very considerable. Propaganda and instruction on the part of the Government will be necessary, combined with the provision of local marketing facilities as indicated above. The question of pests and diseases attacking this crop is also important in this connexion. I consider that Chinese and possibly Indian small holders would be more willing to take up this crop. In the West Indies, the Imperial Department of Agriculture succeeded in establishing cotton growing in certain of the smaller islands as a successful "cottage" industry among the Negros.

Roselle would form a suitable catch crop with young rubber or coconuts on good quality soil fairly free from timber. It would probably pay at least for part of the cost of clearing the land of timber. Two crops, or possibly three, could be grown before the young trees were fully three years old.

Roselle should be suitable for plantations of large area where it would be grown under European supervision and on lines in accordance with good agricultural practice.

While the preliminary results so far obtained are promising, it is not possible to express an opinion as to the ultimate prospect of success with this crop, until the results of the experiments now starting are available.

PRECIS MINUTES OF A MEETING OF THE ADVISORY COMMITTEE, DEPARTMENT OF AGRICULTURE.

Held at the Office of the Director of Agriculture at 10.30 a.m. on December 6th, 1920.

Present: Director of Agriculture (Mr. L. Lewton-Brain), Mr. J. French, Mr. Ritchie, Mr. Gillespie, Mr. R. M. Richards and Mr. G. W. B. Gray, Assistant to Director (Mr. F. de la Mare Norris), Secretary.

Absent: Hon'ble Mr. R. C. M. Kindersley, Messrs. H. Armstrong, J. Bruce, J. S. Ferguson, W. R. Shelton-Agar, C. Burn Murdoch and Towkay Lee Kong Lam.

Messrs. G. H. Corbett (Government Entomologist) B. Bunting (Agriculturist) and W. N. Sands (Acting Economic Botanist) attend the meeting.

1.—Confirming of Minutes.

The minutes of the previous meeting held on June 1st, having been circulated, are taken as read and confirmed.

2.—Progress Reports.

Mr. Ritchie brings up in this connection the question of Staff shortage; The Director informs him that the Chief Secretary had considered favourably their request that he would meet a deputation of the Advisory Committee.

The Chairman is requested to write in again about the deputation.

3.—Large Scale Farm.

The Director of Agriculture informs the Committee that they had given up for the present the Sungei Buloh area, much of which was under water in the wet season. A start had been made at Serdang.

The Agriculturist reads out a planting programme, which had been drawn up, and the Secretary is instructed to circulate this to members.

In reply to a question by Mr. G. W. B. Gray, Mr. Bunting informs them that experiments with cocoa would be carried out on 1 acre. Quinine was being dealt with separately.

4.—Special Division of Department of Agriculture to deal with Food Production.

The Director of Agriculture informs them that he had received no further information from Government on this point. He had written to Government asking for their policy.

5.—Sapintas Estate.

The Chief Secretary's decisions with regard to certain points in the Manager's Agreement and on the question of a bonus to the previous Superintendent were noted.

6.—Visit to West Africa by Mr. Jack.

The Director of Agriculture stated that this had not received the approval of Government and reads a short report on the oil palm received from Nigeria.

7. Mr. Richards suggests that someone should go to Sumatra to visit plantations. The Director of Agriculture says he is prepared to spare an officer for a week or two and it is decided to ask Government if this can be done. Mr. Gillespie suggests that someone should also go to report on the matter from a commercial aspect.

8.—Wages of Plantation Coolies.

This was being considered by the Conference of Residents.

The meeting terminates at 12.30 p.m.

REPORT OF THE WORK OF THE INSPECTION STAFF, JANUARY, FEBRUARY AND MARCH, 1921.

Staff Changes and Appointments.

Mr. T. C. Nock relinquished his appointment as Assistant Inspector of Coconut Plantations and was appointed Assistant Agricultural Inspector. He took up his duties in Pahang North on January 3rd, being stationed at Kuala Lipis. At the end of the quarter, arrangements were made to station Mr. J. Fairweather, Assistant Agricultural Inspector, Straits Settlements, in Malacca.

Estates Visited.

The Chief Agricultural Inspector visited Johore in connection with Mouldy Rot disease, Malacca in connection with coconut beetles, and Perak in connection with various matters.

The Assistant Agricultural Inspectors visited a number of estates in their respective states.

Diseases of Rubber.

Pink Disease.—There were no new reports of the occurrence of this disease on estates during the quarter. In Perak it appeared at several places in Kinta district which had usually been almost entirely free. These cases all received treatment. There were renewed outbreaks in Ulu Selangor, and Ulu Langat districts of Selangor, mainly due to a long spell of weather conditions favourable to the disease, but aggravated probably to some extent by the existence of numerous holdings of all sizes up to 100 acres where tapping has been stopped and no work of any kind is being done, so that this disease has remained untreated. In Pahang North, the disease is not so prevalent as might be expected considering that 90 per cent. of the holdings are not tapped and the disease has remained untreated for several months. In Johore, the disease was rather in evidence in rubber holdings along the railway line in the north. Steps are being taken to provide means to deal with this disease on untapped holdings.

Mouldy Rot.—This disease was newly reported from five estates in Negri Sembilan and from two in Johore. In Seremban and Kuala Pilah districts it was fairly bad throughout the quarter. In these districts the rainfall was fairly heavy and on the whole evenly distributed. The disease did not spread from the four holdings in the Jelebu district previously found to be attacked, but its treatment was not satisfactorily carried out and in consequence it is still present. Near the end of the quarter there was also a new outbreak at Mentakab in the Temerloh district of Pahang. At first, twenty-four holdings were found to be infected, but later reports, after treatment, showed only four remaining infected. The outbreak in the Coast district yielded to treatment, while dry weather in Rembau district resulted in the almost complete disappearance of the disease.

One estate in Malacca reported suspected cases of the disease, but an official inspection did not confirm this, the damage being due more probable to bad tapping on poorly renewed bark.

In Johore, continued wet weather, combined with the general apathy as regard treatment, resulted in the occurrence of the disease to a serious extent on many holdings in the previously infected areas.

Special arrangements were commenced to institute a campaign against this disease in Negri Sembilan. A staff of unemployed planters will be engaged, and the disease will be treated on all holdings where owners fail to carry out treatment themselves. The cost will be recovered by civil suit, a loan being given, if owners cannot afford to pay at present. A similar scheme will be suggested for Johore.

Black Stripe.—There were no new reports of outbreaks on estates. There was a bad outbreak in the Jelebu district of Negri Sembilan in February as a result of conditions favourable to the disease. The rainfall was heavy and there were thick mists night and morning.

An officer was transferred from Seremban temporarily to deal with the outbreak. Notices were served on all infected holdings with moderately satisfactory results. A few cases were recorded in Pahang North and in the Temerloh district.

No other rubber diseases call for special comment.

Coconut Pests and Diseases.

Beetles.—In Perak and Selangor, these pests have not been prominent; while the cutting out of coconut trees has been discontinued and existing trees are receiving better cultivation and more attention, probably on account of the fall in the price of rubber.

In Province Wellesley, coconut stumps and trunks are numerous, and, on account of the cost, difficulty has been experienced in persuading the owners to destroy them. Prosecutions for failure to do this work have been started and special attention has been given to this matter. In Penang, instructions are more regularly carried out. In Malacca there is an improvement in the condition of many of the holdings in this respect, and the campaign against coconut beetles is being continued successfully. Around Seremban, beetles are rather in evidence, and special efforts have been made to clear up manure heaps and other accumulations of refuse. This is often difficult as the manure is removed, and it is not easy to trace where it is taken, while open spaces are persistently used for dumping rubbish around Seremban as also around many towns and villages.

The necessity for destroying all such rubbish led the Government Entomologist and the Chief Agricultural Inspector to experiment with the building of a cheap type of bee-hive incinerator, constructed of kerosene tins filled with soil and

covered over with earth. The preliminary experiments on burning wet manure were promising and experiments will be continued. By the end of the next quarter it is hoped that some results will be available.

Brachartona catoxantha.—There was an outbreak of this pest on old, tall, coconut palms at Ulu Kenderong near Grik in Upper Perak. Catching the moths by means of hand nets was tried. No other measures were started as it was thought advisable to allow the parasites to increase and to see if they would control this pest.

Skippers. Hidari Irava.—The caterpillars of this butterfly attacked coconut palms at Batu Gajah in Perak. They soon disappeared however, owing to the attacks of insect parasites and a fungus, which, especially the latter, exercised a most satisfactory control on the pest. The same insects appeared on coconut trees at Kuala Klawang, Seremban and Kuala Pilah in Negri Sembilan, but did little damage except at the first mentioned place.

Rats.—These did serious damage to young coconuts on one estate in Bagan Datoh, and were numerous in adjoining Chinese holdings. Trapping was carried out extensively on the estate, and the manager undertook to supply traps to neighbouring small holders at cost price. The Junior Agricultural Assistant, Perak South, went to the district and persuaded the owners to set traps regularly. They were used at the rate of one trap to five acres. The owners did the work well without resort to the Enactment to enforce the instructions, and the results obtained were satisfactory as the last reports received showed that the rats had greatly decreased.

Bears.—These were recorded to have destroyed several trees in the Coast district of Negri Sembilan by eating out the buds.

General Sanitation on Small Holdings.

Some progress has been made with the clearing up of lalang in certain mukims of the Kinta district in Perak, but in the remainder of the Federated Malay States and in the Colony, practically no action has been taken to enforce orders for its eradication. The situation is most difficult. Undoubtedly lalang and blukar are growing strongly again in many holdings formerly fairly clean. When an owner still manages to live by tapping his trees, there is no reason why he should not weed his land in the afternoons. Mainly, however, the owners have ceased tapping and go out to earn their living, or have entirely abandoned their land and cannot afford to employ labour to clear it. The same difficulty arises regarding the removal of rubber stumps and timber. At present such action is only enforced when the stumps and timber are numerous and likely to spread disease to adjoining land.

In Pahang, an attempt was made to clear Mimosa (sensitive plant) from kampongs at Pulau Tawar. This work had, however, to be postponed to enable the owners to reap the padi harvest.

PADI.

Pests.—The Assistant Agricultural Inspector, Perak, investigated outbreaks of pests at Bruas, in Krian generally, and at the Krian experiment station in particular. In most cases the incidence of the pests was a result of a weakening of the plants caused by inclement weather or unsuitable conditions of soil, drainage or irrigation. At Bruas, the damage was caused by "Bena Kura" (*Podops coarctata*) and rats, combined with poor and sour soil and flooding. But little could be done to improve the situation there. In Krian generally, the chief pests were the stem borer (*Schoenobius bipunctifer*) and an unidentified folgorid bug. There had been, for the time of the year, less rain than usual, and this, combined with the fact that the water in the bendangs was somewhat stagnant, would appear to account for the great increase of these pests. By arrangement with the Executive Engineer, who co-operated most willingly, the water was changed wherever practicable in all the affected localities. This action, combined with heavy rains which followed the dry spell in January, created a marked improvement. By mid-February the folgorid had entirely disappeared and the stem borer was doing much less damage, though still present. In addition to those pests, a leaf-rolling caterpillar, probably a species of Parnara, was present on the padi in Krian, but caused only insignificant damage.

At the experimental station in Krian, light traps were used to catch the stem-borer moths, with somewhat uncertain results, and all attacked shoots were cut off and burnt.

Rats did damage to the padi in Malacca, in places destroying almost the entire crop on an individual owner's land. Simple and practical methods of destroying them were explained and demonstrated. The question of rat destruction in padi land will receive attention this year. It was commented upon in my last report.

CROPS.

The harvest was finished in Province Wellesley and Malacca during the quarter and in both districts the yields were good; in Malacca, in places, they were very good.

Along the Perak River, better crops were obtained than were at first expected, although the pests, referred to in my previous report, undoubtedly caused a considerable reduction in the yields obtained.

In the Negri Sembilan, the crops in the Kuala Pilah and Tampin districts were poor, while in the Rembau district average yields were obtained. The reason for this is obscure, since all districts suffered alike from drought in 1920.

Water Hyacinth.

In Province Wellesley, no legislation for the control of this pest is at present considered necessary. Under advice from the Junior Agricultural Assistant, owners are making progress with its removal from bendangs and drains.

In Perak, the work of clearing the Perak River was in progress and was completed as far as the boundary of the Kuala Kangsar district. A few of the side streams are full of the weed and still require clearing. Bendangs at Bota were being cleared with the assistance of the Assistant District Officer, and some work remained to be done. At the end of the quarter, the special gang returned from the Perak River to Krian. A swamp at Malim Nawar in Kinta district is again becoming infected and action will be taken to clear it.

The question of the control of Water Hyacinth in Malacca is receiving attention; in places the weed is spreading rapidly and may be expected to damage the padi fields.

F. W. S.

AN IMPORTANT ROOT DISEASE ON BORNEO CAMPHOR.

By F. W. South.

AT the end of December last, the Deputy Conservator of Forests, Selangor, brought to the Agricultural Department specimens of two year-old seedlings of Borneo Camphor (*Dryobalanops aromatica*, Gaertn.) which had been killed by a root disease. These specimens were taken from a small patch of land in the Kanching Forest Reserve, Selangor. This reserve consists of an almost pure growth of Borneo Camphor which occurs wild there in large quantities, and is being encouraged and extended by the Forest Department on account of its valuable timber. The seedlings were not introduced from out-side, but developed directly from the seed of the trees already growing in the Reserve.

On examination, it was found that the fungus which had caused the death of these seedlings was a soil fungus known as *Rosellinia bunodes*, (B. and Br.) Sacc. This fungus has been reported from India and the West Indies as an important parasite, and is capable of attacking a large range of host plants. It has also been recorded from Ceylon, but only as a saprophyte. It would seem that it is indigenous in this country from the fact of its occurrence in a Forest Reserve devoted to the cultivation of an indigenous tree by methods which do not involve the introduction of planting material from outside. Ridley described in 1900, the attack of a similar fungus on the roots of certain plants in the Singapore Botanic Garden; and Massee named it *Rosellinia echinata*. It is now generally held that Massee's *Rosellinia echinata* is identical with *Rosellinia bunodes*. Ridley's account will be found in the Agricultural Bulletin of the Straits Settlements and Federated Malay States, No. 9, May, 1900, page 287. Massee quotes Ridley's note on page 236 of "Diseases of Cultivated Plants." Chipp in the Garden's Bulletin, Straits Settlements; Volume II, January 7th, 1921, Nos. 9, 10 and 11, records the fungus sent to Massee by Ridley as *Rosellinia bunodes*.

These are the only records of the presence of this fungus in the Malay Peninsula, which have been found up to the present.

Attention has been called to the presence of this parasite, because of the damage it has done to lime and to cocoa plantations on recently cleared jungle land in some of the West Indian Islands. According to Petch, it has also occurred on Coffee plantations in Southern India; while Butler records it as causing "stump rot" in pepper gardens in Mysore. It seems to be of very limited distribution in this country, and has never been found on Para rubber here, but the very various nature of its recorded hosts admits of the possibility of its attacking Hevea and other cultivated plants in this country.

The account of this fungus in the West Indies is given by Nowell in the West Indian Bulletin; Vol. XVI, No. 1. The crop plants on which it has been found in some of the lesser islands are cacao, limes, castilloa rubber (*Castilloa elastica*) camphor (probably Cinnamomum Camphor) and arrow root. It is also recorded on the West Indian forest tree *Sterculia caribaea*, known locally as the "mahoe cochon," on *Inga laurina*, the "Pois doux" of the West Indies, and on other species of Inga; on hibiscus, and on Acalypha. It probably occurs also on coffee in Porto Rico. In the Indian pepper gardens, in addition to pepper it has been found to attack *Litesa angustifolia*, *Litsea Wightiana*, *Schleichera trijuga*, *Holigarna longifolia* and *Grevillea* robusta, the last being a well known shade tree. Butler describes the pepper "stump rot", and records the hosts mentioned above in his book "Fungi and Diseases in Plants" page 357. Ridley's fungus in Singapore was found on *Ficus dubia*, on Dracaenas, rattans, Dieffenbachias, and on various shrubs and even herbs growing together under the Ficus. It is thus a root parasite capable of attacking a wide range of host plants, belonging to widely different families.

The fungus sometimes begins its attack from a decaying jungle stump, but it may also apparently germinate on, and spread from heaps of damp leaves and twigs. It may run in the surface layer of the soil from one small root, or dead twig, to another, or even in the damp surface mulch of decaying leaves and twigs on the top of the soil. The present writer has seen it in Dominica, running along such a deposit under a hedge. When it reaches the lateral root of a suitable living plant it grows up this and then spreads round the collar, finally killing the plant. Often death is very sudden on trees such as limes; an apparently healthy green tree may die in two or three days and retain its withered leaves so that it has the appearance of being scorched. Ridley thought at first that the plants killed by Rosellinia had had weed killer poured over them by mistake, so suddenly did they die.

The fungus covers the attacked roots and the collar with a dark felt of external mycelium; in damp and shady situations on a dead tree, this covering may extend up the stem above ground for a distance of from 6 inches to 2 feet. The advancing edge of the external mycelium is smoky grey, and the hyphae are light and cobweb-like in appearance; behind this the mycelium is denser and becomes dark olive green in colour, passing into a purplish black in the old parts. In damp places, the older mycelium develops a mass of closely packed black hairy conidiophores projecting at right angles to the attacked stem, and having the appearance of felt. When ripe, the tips of these are branched and hyaline, and bear small white hyaline conidia; at this stage the surface of the conidial layer is grey or nearly white. These conidia serve for the rapid propagation of the fungus. Later, in damp sandy places, the perithecia develop on the base of the stem above ground, sometimes to a height of one foot or more above the soil level. They are spherical, warty, black structures, about 1.6 mm. in diameter, closely crowded

together and often partly buried in the mycelium. In the centre of each is a smooth space or a small smooth papilla, from the mouth of which the ascospores are extruded in a black tendril. The spores are produced 8 in a sack, inside the perithecium. Each spore is black, hard, and boatshaped, and has a long, fine, black appendage at each end. These spores serve to carry the fungus over a spell of dry weather or any period of difficulty. A good example of the perithecia was seen on one of the Camphor seedlings from Kanching.

The mycelium penetrates through the bark of the root or stem of the host plant, the penetration beginning a short distance behind the advancing edge of the mycelium. Ultimately it also traverses the wood. The fungus penetrates in the form of very narrow black mycelial cylinders, about 0.5 of a millimeter in diameter, running transversely through the bark and wood. When a diseased root or stem is cut radially and longitudinally, the penetrating mycelium appears as black lines running inwards in the bark and wood: the same appearance is also seen in a cross section. In a tangential section, however, the mycelium appears as black dots. This appearance in section is somewhat characteristic. The wood of a diseased plant finally becomes dry and light and the bark is almost completely rotted.

The treatment for this disease follows that for root diseases in general. The infected area should be isolated carefully by a trench 2 feet deep and one foot wide, placed so as to include a margin of apparently uninfected soil 2 or 3 feet wide all round the patch. All soil from the trench should be thrown inside the infected patch. All the diseased plants inside the trench should then be dug up and burnt, with as much as possible of the surface cover of leaves and twigs. The patch should then be well limed, at the rate of about two tons of lime per acre, and should be well forked over, all bits of wood in the soil being removed and burnt. Any stump near the infected patch should be carefully examined for the fungus and, if found to be infected, should be dug out and burnt. The isolating trench should, at any rate at first, be kept as free as possible from leaves and twigs, owing to the power of this fungus to run along the soil surface in a layer of such composition. It would probably prove safe to replant formerly infected land after an interval of 12 months.

THE FLOWERING AND FRUITING OF HEVEA BRASILIENSIS.

THE following is a résumè of an important botanical contribution by Dr. C. Heusser, published in Rubber Series Bulletin No. 24. (December 1919) of the General Experiment Station of the A. V. R. O. S. under the title "Over de Voortplantingsorganen van Hevea brasiliensis, Müll. Arg."

The paper is highly technical in character and considerable portions of it are not referred to here; however, those readers who may desire to obtain further details concerning the morphology and anatomy of the flowers, seed and fruit of Hevea can consult the original article.

Wintering and Flowering.

The flowering of Hevea is closely connected with the shedding of the leaves. This wintering, or resting period, of the trees lasts a relatively short time for each tree, and takes place at the commencement of the dry season.

The sprouting of the flower-heads from the end and topmost side-buds of the flowering branches begins before the young leaves appear, and sometimes even before all of the old leaves have fallen off.

Young trees, when grown under favourable conditions, may flower, but do not winter until their fourth year. Trees in their prime, growing in regions with few changes in the distribution of rainfall, and without a definite dry season, flower very unevenly. The flowering period of a plantation may extend over a period of three months or more. On the East Coast of Sumatra, for example, trees can be found wintering and flowering throughout the year; the chief flowering time, however, is between February and April. In Java, flowers are produced from the beginning of August till October, and in Ceylon, from January to March. In the natural habitat of Hevea, the Amazon region, flowering should begin in July,—judging from meteorological records. The earliest period in which the tree can flower is three years. In its seventh year it flowers abundantly.

Inflorescences arise in the axils of the scale-leaves at the end of the flowering branches. On vigorous branches they develop in the axils of the lowest foliage leaves.

Development of the flowering shoots may proceed in two ways. Usually before flowering, and before the inflorescences have completed their full growth, the growth in length of the young branch takes place and the leaves develop. The flowering tree is then covered with leaves. The flowering is delayed by twig and leaf formation taking place simultaneously and lasting from 3 to 4 weeks. At the end of this time the floral organs are mature. In the other case the growth of the young shoot is

retarded; the inflorescences are packed close to each other, and the flowering takes place whilst the tree is still bare of leaves. In this instance, the bare tree is in full flower two weeks after the opening of the inflorescences. It is not yet possible to decide whether this is an accidental feature or a hereditary character.

The inflorescence is conical in shape with numerous side-branches. When well-developed, its side-branches may contain secondary and tertiary branches. The inflorescence is not uniform in character, but may be described as a panicle with chiefly dichasial end-branching.

The Flowers.

Hevea has unisexual flowers and is monoecious; that is, the flowers are entirely male or female and appear with each other on the same tree and in the same inflorescence. Superficially male and female flowers resemble each other, but if observed closely, even a non-botanical person can distinguish differences between them. The male flowers, which constitute the majority, are yellow in colour, bell-shaped and from 6-8 mm. in size; they are attached to thin stalks mainly in a dichasial arrangement on the branchlets. The female flowers are somewhat larger than the male ones, and are always situated at the end of the chief axis and the principal side-branches, rarely on the secondary branches. The female flower is borne on a thick green stalk which is enlarged into a disc at the base of the perianth; this disc is absent in the male flower. The chief difference between the flowers lies, of course, in the sex organs.

Male and female flowers have a single tubular perianth. A study of the comparative morphology of the flower indicates that the perianth represents the calyx and that the corolla is missing. The whole flower is covered with a fine felt of hairs.

The male flower has ten stamens which stand in two alternating circles against a conical pillar. The stamens of the lower circle alternate with the floral leaves of perianth segments. The anthers are normal, having two anther-lobes each with two pollen-sacs. The anther lobes dehisce lengthwise; this generally takes place before the flower opens. The central column is a rudimentary pistil. In at least fifty cases the top of it has been found to be divided into three parts; these are rudimentary stigma lobes.

The quantity of pollen produced by each flower is relatively small. In each pollen-sac there are about 32 pollen-grains; per anther 96, and per flower, ten times this number, or approximately 1,000. The pollen-grains measure from 25-30 microns, and are triangular in shape. In each angle there is a pore. The pollen-wall consists of two layers from 2-3 microns thick. The inner layer (intine) is often thicker than the outer (exine). The continuity of the exine is disturbed at the pores. Seen under powerful magnification the exine has a fine sculptured surface. In dry pollen, the pollen-wall is folded towards the interior, forming a seam such as is seen in the coffee bean; this seam fills out when the pollen becomes damp.

Plate I.

Fig 1.—Diagrammatic sketch of the inflorescence of Hevea showing the manner of flowering. ♀ ♂, female flowers and *a*, *b*, *c*, etc., the order of opening.

Fig. 2.—Sketch of a small branch (dichasium) with male flowers only, and 1, 2 and 3 the order of opening.

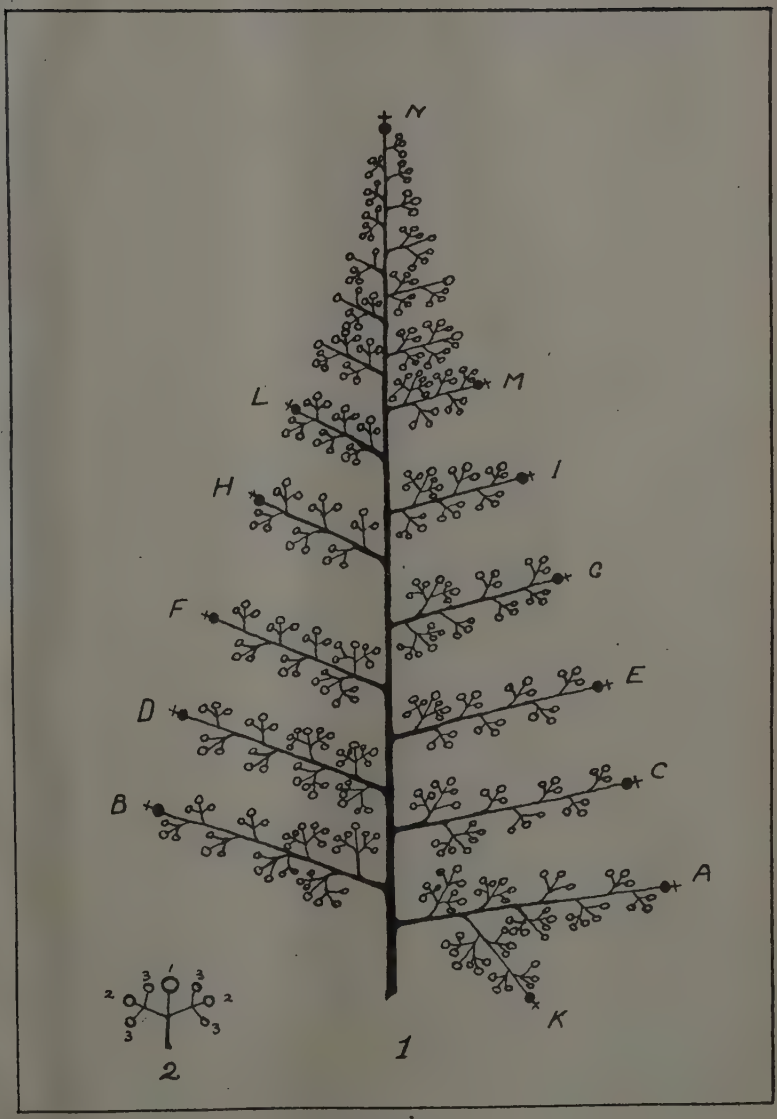


Plate I

Plate II.

Fig. 1.—Male flower (enlarged) with part of calyx removed. C, the central column or rudimentary pistil; S, the stamens in two rows.

Fig. 2.—Female flower (enlarged) with part of calyx removed. N, stigma; P, pistil; St., staminodes; Di., disc.

Fig. 3.—Central column of male flower with stamens seen from above.

Fig. 4.—Pistil of female flower seen from above.

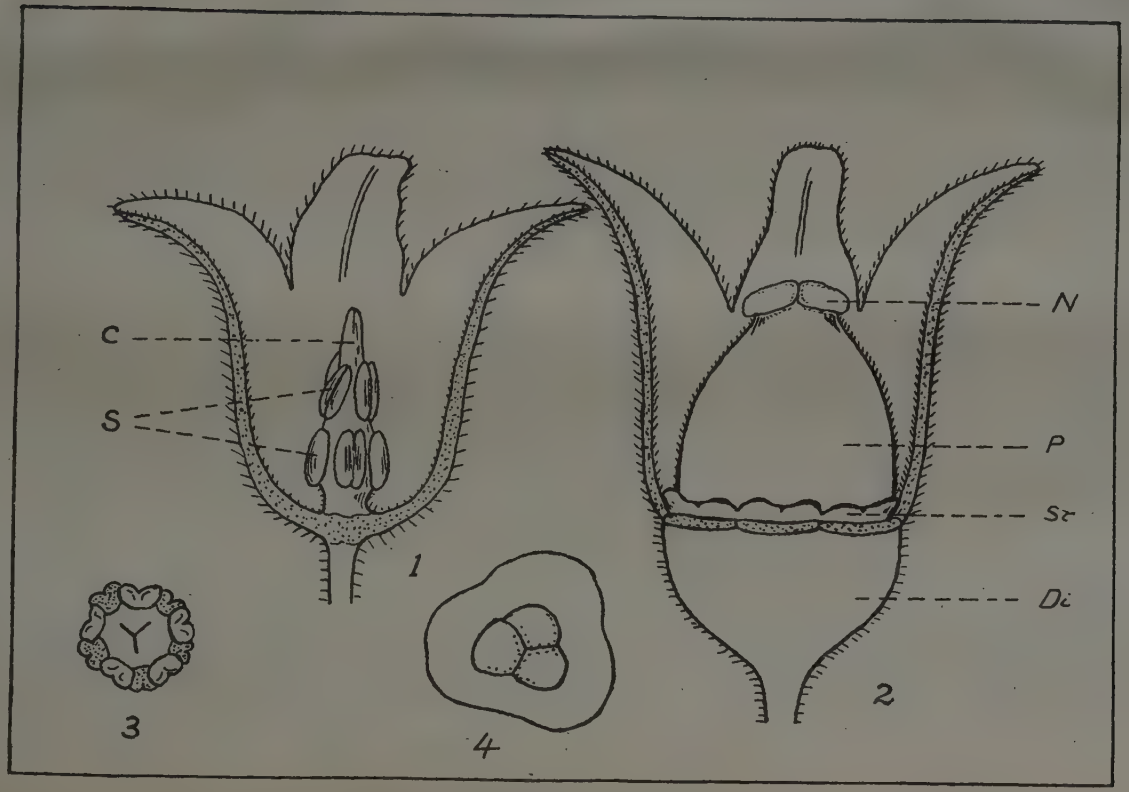


Plate II

In distilled water, the pollen-grains burst after a few minutes immersion; in a solution of sugar at a slower rate, but always in a definite relation to the concentration of the solution. In a solution containing 20 per cent. of cane sugar and 1½ per cent. of gelatine, the grains burst in about an hour. In this medium an apparently normal pollen-tube will sometimes be produced that grows to double the length of the pollen grain; eventually however, the top of it always bursts with the result that the contents of the tube are forcibly ejected. A 30 per cent. sugar solution makes the pollen swell, and in rare cases to germinate. Foreign stigma-tissue added to the sugar solution exercises no clear accelerating influence on germination. It is estimated from observations on the degree of concentration of sugar solutions that exactly brings about the swelling of the pollen-grain that the cell-contents, as a result of the absorption of water by the cell-wall, exercise a pressure of 20 atmospheres; this leads to the conclusion that the pollen of Hevea is extraordinarily sensitive to water. Owing to this sensitiveness to water, and perhaps also to a very moist atmosphere, the chances of egg-cells being fertilized in regions where there is much rain during the flowering period is greatly reduced.

The female flower has in its centre a short triangular pistil which consists of three fruit-leaves or carpels; a short style and three broad stigma segments. The stigma is situated directly on the ovary. Each carpel forms a fruit partition. In the cavity, or loculus, of each division there is a single ovule. The ovule is pendulous and turned slightly backwards with the micropyle pointing upwards. It is termed botanically, an anatropous-apotropous ovule.

When the flower opens, the stigma is pale yellow and lustrous. After four days it is coloured dark red, then dries up. If fertilization has taken place, the loss of colour follows sooner.

Between the pistil and the perianth there arises a circlet of ten protuberances. The position of these excrescences and their prematurely vigorous disposition indicate that they are rudimentary stamens, or staminodes.

The central column in the male flower is an imperfectly developed pistil and the staminodes of the female flower undeveloped male organs.

The flowers of Hevea are very juicy, and rich in latex. The slightest wounding of the tissues results in a flow of thick latex which quickly turns black. The sap of the flower reacts with Fehling's solution and with thymol sulphuric acid, thus indicating sugars.

The odour of the flower is intensive. Specker compares it with that of the rare orchid, *Herminium monorchis*, Z. The flower colour is yellow and resembles that of linden-blossom. The colour, however, may vary from sulphur-yellow to ochre-yellow.

The order of the opening of the flowers of the panicle runs parallel to their arrangement on the branchlets. In the rarer racemose type the under-most flower is always the oldest and opens first. When the form is chiefly dichasial, the oldest flower is always the top central one and opens before those on each side. The female flowers at the tips of the principal branches open in centripetal order as described below. The period of development of the female flower lasts longer than that of the male, but the flowering of the male ones extends over a greater length of time. A combination of these factors leads to the following condition:— In a panicle the male flowers open first, commencing with the top flower of the oldest dichasium, frequently this occurs on the first branch of one of the lowest side-branches with male flowers only. In a large panicle the opening of the male flowers extends over a period of two weeks. In the middle of this flowering time the female flowers open, first the end blossoms of the lowest side-branches, and the last, those at and near the tip of the main axis. The opening of the female flowers takes place in 3 to 5 days. Hevea, therefore, is not protandrous.

Over-production of flowers is very large. A flowering branch contains on an average 12 inflorescences, on each of which there are about 6 female flowers. On some panicles there may be no less than 50 female flowers and on others none. Counts of large numbers of flowers have shown that to a single female flower, there are approximately 60 male ones. If it is estimated that a fertile tree produces one fruit per flowering branch, then this is a fruit resulting from 72 female and 4,320 male flowers.

Male and female flowers open in the sunshine for about an hour during the first hours of the afternoon. In cloudy weather the buds remain closed until the following day. Flowers which do not open by three o'clock remain closed that day. The mechanism of the opening of the flower is simple; once the flower opens it never closes again.

The flowering period of a male flower lasts from one to two days—the flower is then shed. The female flower is more persistent; its stigma is receptive for at least three days, after which time, provided the ovules have been fertilized, it dries up. The pistil of a barren flower is preserved for a longer period; it is starved slowly and is not dry until at least 12 days have elapsed. It is not posible to ascertain definitely whether an ovule has been fertilized, until 3 weeks after pollination.

A normal course of development is followed by the floral members and sex-cells of the male and female flowers.

Pollination.

The intensive odour, the clear yellow colour, and the richness of the flower tissues in sugar, indicate that the flowers are entomophilous, that is, adapted for insect pollination. Wurth and Arews in Java observed several flies as well as moths of the Syntomidae family on Hevea flowers. On the East Coast of

Plate III.

Sketch of a pistil with an ovule ready for fertilization. N, stigma; Ob, obturator; Te, outer integument; Ti, inner integument; Nu, nucellus; E, embryo-sac; Ch, chalaza; F, funiculus.

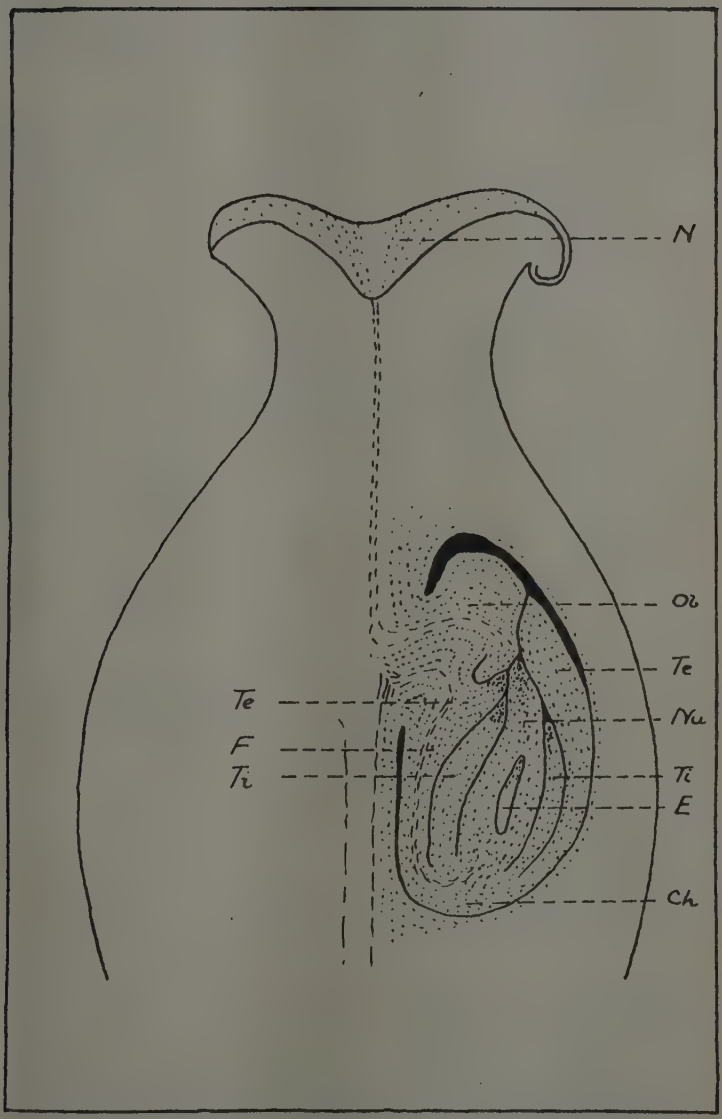


Plate III

Sumatra repeated visits of flies have been observed. The insects trample on the flowers and explore with their probosces the inner wall of the perianth. Possibly the insects push aside the bristly hairs to sip the sap which flows out when the flower tissues are pierced. Ants, a small brown beetle (Nitidulidae), and even male mosquitoes have also been seen on the flowers; these, however, are probably of less importance in effecting pollination than the former. Small bees are assiduous visitors and, in flying from flower to flower, are responsible for much of the work of pollination. The bees are of the same species or closely allied to those which frequent the flowers of palms and papayas. In this part of the world, Hevea does not appear to have a special insect visitor to its flowers. In the Amazon region it may have one or more.

Pollination by means of insects can be either "self" or cross-pollination. Generally the pollination will be self-pollination, and only when the insect visits another tree will cross-pollination take place. From a breeding standpoint it is important to know whether Hevea can be self-fertilized. Results obtained in many artificial pollinations lead to the conclusion that Hevea is adapted for cross-pollination but is not absolutely self-sterile. There are trees which produce fruits as a result of self-pollination, but generally speaking "selfing" is unsuccessful. It appears, therefore, that the species *Hevea brasiliensis* contains both self-sterile and self-fertile varieties. It should be mentioned also that there are many trees which, in spite of an abundance of flowers and cross-pollination, set no fruits. Further investigations are desirable in regard to this matter.

Variations in Flowers.

Even in the small flowers of Hevea, variations and abnormalities are seen in individual trees. Among those observed are:

(*a*) Variation in length of perianth segments to almost double the normal;
(*b*) ,, ,, flower, colour-sulphur to ochre yellow;
(*c*) ,, ,, flower odour;
(*d*) ,, ,, arrangement of flowers on the branches of the inflorescence, racemose or dichasial;
(*e*) ,, ,, the number of female to male flowers-few or many;
(*f*) ,, ,, the number of carpels- 2 rare, 4 fairly common, 5 seldom;
(*g*) ,, ,, the number of perianth segments from the normal 5, to 6 and 7;
(*h*) Abnormal inflorescences with faciated end-branches and monstrous flowers;
(*i*) Male flowers, or a branch with male flowers, arising out of a female flower;
(*j*) Male flowers with a disc.

Fertilization.

As already shown, the number of fruits set by Hevea is relatively few. It was thought, at one time, that this might be due to inefficient pollination, especially as the pollen and ovules showed no anatomical abnormalities, but artificial pollination proved that this was not the case, or only to a limited extent. In 500 cross-pollinations, only 77, or 15 per cent., bore fruit, although only 9 flowers per flowering shoot were dealt with. The true reason is to be sought elsewhere. It appears that much of the pollen is not viable, or that the stigma tissue is not in a condition to induce the pollen to germinate. It is conceivable also, that a tree can only produce a limited number of fruits, which number would depend on the state of the tree's health, nutrition and weather. The shedding of young fruits rarely occurs; it was observed on one occasion however after a second abnormal wintering.

A low fruit-setting and the long time the unfertilized flowers remain on the inflorescences, combine to make the study of the fertilizing process in Hevea a most difficult undertaking. The time between pollination and fertilization is fairly long; it is certainly more than 3 days and less than 12 days.

The development of the fruit in its entirety is interesting. After the fertilization of the egg-cells, growth proceeds gradually. First the fruit-wall grows intensively and independently of the development of the ovules. It attains its full size in about 3 months, or $2\frac{1}{2}$ months before the fruit is ripe. Owing to this rapid growth, the ovules hang as small white protuberances in the large roomy fruit partitions or *loculi*. Another rapid and analogous growth takes place afterwards in the development of the seed-coats; these reach their normal size about the fourth month after fertilization, and as they grow they are pressed against the dry wall of the fruit. Partially as a result of this pressure, they assume their peculiar shape. Two months before the fruit is ripe, the embryo cannot be seen with the naked eye; however, in the last stage of the growth of the seed it develops quickly and attains its full size. The fruit-wall can develop normally without an embryo being present in each seed. Hitherto, no fruit of Hevea has been observed, in which the absence of an ovule was externally indicated as in apples, but fruits, which appeared to be normal externally, had seeds without embryos.

The Ovule and Seed.

In the ripe seed, the structure of the ovule can be traced back. From the embryo the germ, and from the endosperm and nucellus the kernal of the seed orginates, the integuments, or two outer portions of the ovule give rise to the seed-skin. A growth, formed an obturator, develops above the ovule and serves as conducting tissue for the pollen-tube in its passage from the style to the micropyle or canal leading to the nucellus and

PLATE IV.

Longitudinal section of the top of a young seed. M, micropyle; L, thin layer of cylindrical cells through which the radicle is forced on germination; O, outer seed-skin; I, inner hard seed-skin; S, spongy layer; E, young embryo; P, perisperm; En, endosperm.

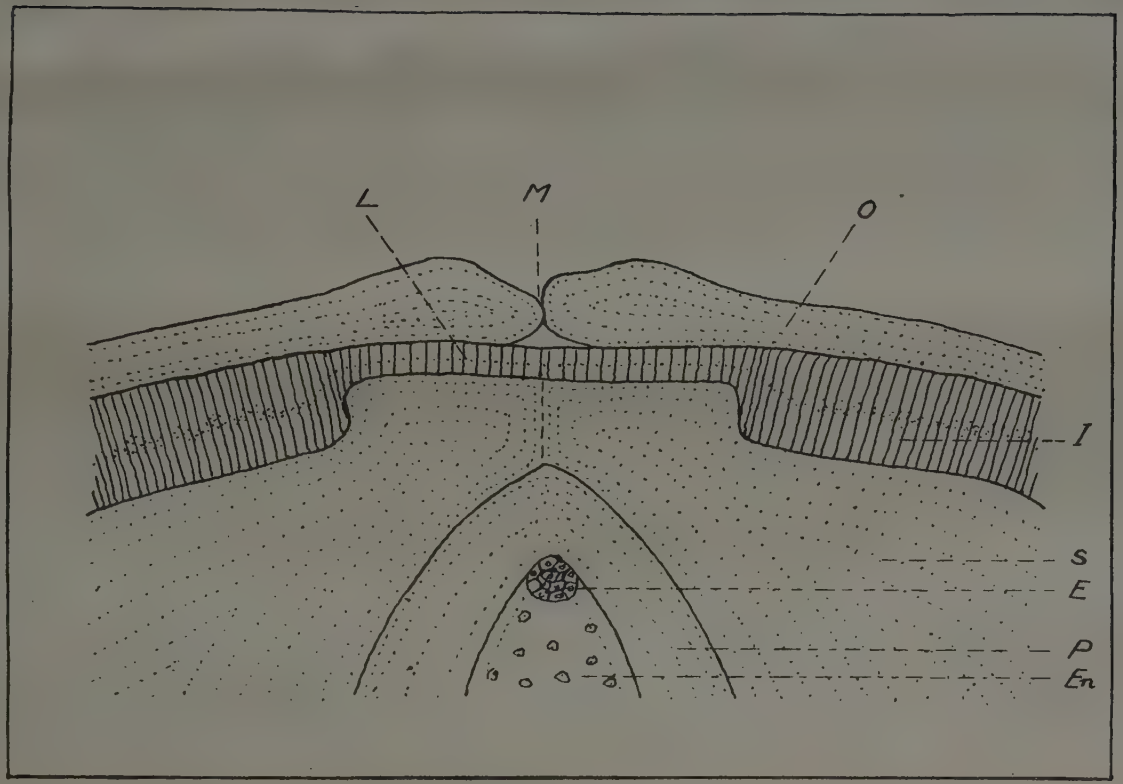


Plate IV

embryo-sac. Below the obturator and near the micropyle, another peculiar growth of the funiculus, or stalk of the ovule, and the outer integument subsequently takes place to form what is known as a caruncle. This body is merely an appendix to the seed which in Hevea dries up before the fruit bursts. In certain other Euphorbiaceous plants, the caruncle performs a useful service in that it aids in the distribution of seed. The caruncle in these plants remains behind in the small ripe seeds, and as it contains oil-holding tissue attractive to ants, these insects carry away the seed. Hevea seed of course, owing to its large size, is not adapted for dispersal by insects.

The outer integument forms the outside seed skin. The epidermal cells of this skin are flat and polyhedral with round pores in places between them. Before the ripening of the seeds red colouring matter,—an anthocyanin, is formed in some of the epidermal cells, with the result that the young seed is covered with red spots and stains. The coloured cells lie singly or in groups, and the anthocyanin in them occurs in small globules or lumps; the cell-sap however, is not coloured. In the ripe seed, the membranes of these cells contain a brown and very durable pigment which gives to the seed its lustrous dark-brown design. The brown colour is formed whilst the anthocyanin is still present, so that the pigment is not merely a degenerate product of the anthocyanin. The cells lying under the epidermis retain light, and it is these which give to the seed the white and light-brown colour effects. The spot-markings of Hevea seed are different for each tree, so that every tree produces seed of a distinct pattern. Self-coloured seeds have not been seen, and it is probable that they do not exist.

The inner integument has important functions to perform. In the young seed it occupies the chief place. The vascular bundle of the stalk of the ovule, after splitting into twelve branches, traverses it. The cells are crammed full of starch at the commencement of the development of the seed, so that this integument acts as a transport organ and reservoir for food materials; further, it supplies the embryo and its feeding tissue,—the perisperm,—with much timely food. The epidermis of the inner wall consists of thin-walled cells, and it is close to this that the first laticiferous vessels are formed. The epidermis of the outer wall of the inner integument is an extraordinarily beautiful tissue of cylindrical cells; these cells begin to get woody in the fourth month and then form the hard seed-skin or shell. Under the micropyle, over a space of about 4 mm. the cells remain wide and short so that here the shell consists of a thin membrane covering the opening.

During the growth of the embryo and perisperm, the tissues of the inner integument are exhausted and shrink to a light spongy stratum. This spongy material is useful, in that it forms a good insulating layer of low specific gravity, whereby the seed can float and thus be transported by water.

The kernel of the seed, or perisperm, is derived from the nucellus. At the outset it forms a thin transparent layer against the inner integument. Early in the fifth month it becomes thick-walled, and finally occupies the largest space in the seed. All the food materials, from which the young plant obtains nourishment in the earliest stages of its growth, are stored in the perisperm. The food consists chiefly of starch and oil.

The endosperm owes its origin to a double fertilization, that is, one male cell enters into the formation of the embryo and the other into the formation of the endosperm. During the development, the endosperm forms a thin layer of tissue lying against the perisperm. In the ripe seed it is scarcely visible to the naked eye.

After fertilization, the egg-cell divides up to form the embryo or germ. The embryo consists of cotyledons, plumule and radicle. The two cotyledons, or seed-leaves, lie in a median line in the seed at the foot of the embryo: they are broad and somewhat kidney-shaped. Between these lies the plumule or young shoot. The radicle, or primary root, is turned towards the micropyle with its tip lying close to the thin covering membrane at the top of the seed which has already been described. The stem portion of the embryo, between the cotyledons and radicle, is the hypocotyle. On germination, this stretches itself and pushes out the radicle from the micropyle. The radicle bends itself towards the earth in response to gravity and forms the tap-root with its wreath of side-roots. After this, the petioles of the cotyledons lengthen and place the plumule outside the seed. The cotyledons themselves remain behind in the seed and supply food from the perisperm to the young plant.

The Fruit.

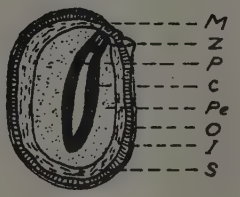
The fruit of Hevea is a three-cornered three-partitioned box or capsule. At first it has a wall, uniform in character; but a month after fertilization it begins to change. The outermost layers are green and rich in latex, and vascular bundles run through them. When the fruit is ripe, they shrink together and dry up. The inner layer of the wall of the fruit becomes woody, after the fruit has attained its full size, and then consists of mechanical tissue which, when the fruit is ripe, causes the fruit partitions to spring apart from each other. The bursting takes place with a loud report; the six parts fly from each other and throw the seeds out in great arches up to a distance of 15 metres. The specialized tissue, that causes this tension, is composed of three layers. The innermost layer and the outer-layer consist of long wood filaments. These filaments all run parallel to the upper surface, whereas those of the middle layer are somewhat shorter and arranged in a perpendicular manner with respect to the outer and innermost layers. In the outer-layer they are directed towards the middle, slanting upward; in the lowest they slant downwards. Through the drying up of the skin, the outside and inside layers are drawn together in different directions. Provided

Plate V.

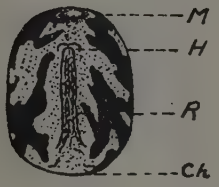
Fig. 1.—A germinating seed.

Fig. 2.—Longitudinal section of a seed.
M, micropyle; Z, radicle; P, plumule; C, cotyledons; Pe, perisperm; O, outer seed-skin; I, hard seed-skin; S, spongy layer.

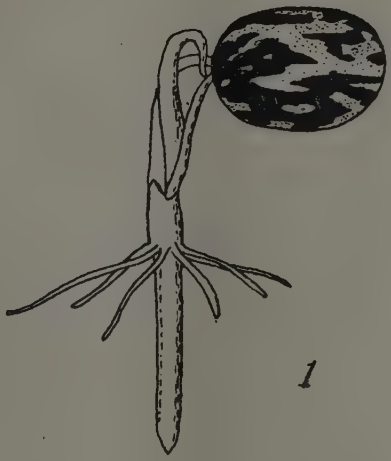
Fig. 3.—Seed seen from underside.
M, micropyle; H, hilum; R, raphe; Ch, chalaza.



2



3



1

Plate V

the pull is powerful enough, each section of the fruit is split in half along a tearing line already formed. The anatomical features of the middle layer of the mechanical tissue indicate that it possesses elasticity.

Characters of Seed.

Hevea seeds vary in form, colour, size, weight and other characters. Seeds from different trees compared with each other show obvious differences. Seeds from one tree, however, vary within fixed limits, and plainly indicate a definite type. With respect to colour and the design of the seed-coat each tree has its distinct types. The size of the seeds varies greatly. The form of the seeds is in some respects correlated with size. Large seeds are oblong ovoid; small seeds are more globular. The weight of the seed and the size of the germ-pore are, according to Specker, correlated with the size of the seed. Other varieties in seed characters are noted, as well as certain abnormalities seen in seeds and seedlings.

The drawings illustrating this article have been copied by Mr. J. N. Milsum from Dr. Heusser's paper and are published with the author's kind permission.

W. N. S.

THE IMPERIAL BUREAU OF MYCOLOGY.*

THE Imperial Bureau of Mycology is the outcome of a proposal unanimously adopted by the Imperial War Conference in 1918 that a central organisation should be established for the encouragement and co-ordination of work throughout the Empire on the diseases of plants caused by fungi in relation to agriculture. The Committee of Management consists of some of the foremost biologists in the country, with Viscount Harcourt as Chairman, and includes the following members: Professor I. Bayley Balfour, M.D., D.Sc., F.R.S.; Mr. W. Bateson, F.R.S.; Professor B. H. Blackman, F.R.S.; Professor F. O. Bower, F.R.S.; Mr. A. D. Cotton, F.L.S.; Professor H. H. Dixon, F.R.S.; Professor J. B. Farmer, F.R.S.; Captain A. W. Hill, F.R.S.; Professor W. H. Lang, F.R.S.; Sir Daniel Morris, K.C.M.G.; Mr. J. Murray, Mr. Pethybridge, B.Sc., Sir David Prain, C.M.G., C.I.E., F.R.S.; Dr. A. B. Rendle, F.R.S.; Mr. H. N. Ridley, C.M.G., F.R.S.; Professor R. A. Roberton, F.R.S.E.; Sir A. E. Shipley, G.B.E., F.R.S., Professor W. Somerville, F.R.S., and Dr. H. W. T. Wager, F.R.S.

Dr. E. J. Butler, late Imperial Mycologist, Director of the Research Institute, Pusa, and Agricultural Adviser to the Government of India, has been appointed Director and has started work at the headquarters of the Bureau, No. 17, Kew Green, Kew; this site has the advantage of proximity to the fine library and collections of the Royal Botanic Gardens, Kew, with the Director and staff of which the Bureau will work in co-operation.

The funds of the Bureau are provided entirely by contributions from the various self-governing Dominions, India, Egypt and the Soudan and the non-self-governing Colonies and Protectorates. It will work broadly on the lines of the existing Imperial Bureau of Entomology at South Kensington, and will aim at doing for the other great class of destructive agencies in agriculture, namely the diseases and blights of plants caused by fungi, what the older Bureau has so successfully done in regard to injurious insects. It will be a central agency for the accumulation and distribution of information and for the identification of specimens sent in from all parts of the Empire. It is proposed to issue, as soon as funds permit, a periodical journal through which those interested in mycological work in regard to agriculture will be kept informed of progress elsewhere. There are at present over fifty officials engaged in this work in the overseas parts of the Empire, while the number of agriculturists, planters and others interested practically is legion.

* Enclosure in Colonial Office circular despatch of 31st December, 1920.

The effect of fungus diseases in reducing crop production is great beyond calculation. A Canadian scientist has estimated the loss caused by rust in wheat in the prairie region of Canada in 1917 at 100,000,000 bushels representing a value of between £25,000,000 and £50,000,000. For the same year the loss in the five chief cereals in the United States exceeded 400,000,000 bushels. The effect of this on the provisioning of the world may be easily imagined.

MINUTES OF FOURTEENTH ANNUAL GENERAL MEETING OF THE PLANTERS' ASSOCIATION OF MALAYA,

held at 12, Market Street, Kuala Lumpur, on 19th May, 1921, at 11 a.m.

PRESENT:

Mr. J. W. Kennedy (*Chairman*)

„ C. Ward-Jackson (*Secretary*)

and the following members:

From the	Batang Padang D.P.A. ...	Messrs. C. B. Graburn, H. Gordon Graham, W. P. Wilson, H. Miller Mackay and E. M. P. Landon
„	Bahau-Kuala Pilah D.P.A.	Messrs. C. W. Keppel-Powis
„	Central Perak P.A. ...	„ C. Kenneth Cox, E. L. D. Evans and G. E. Johnson
„	Johore P.A.	The Hon. Mr. C. Bradbery, the Hon. Mr. W. N. Gawler, Messrs. C. W. Bradburne and S. G. Sinclair
„	Kajang D.P.A.	Messrs. G. L. O'Hara Hickson, E. G. Leyne, C. R. Ferrers, H. L. Lamotte, C. Gordon Jeavons and Capt. K. G. Furley
„	Klang D.P.A.	Messrs. T. J. Cumming, M. A. P. Gilman, W. S. Reeve-Tucker, H. Case, W. H. Bragg, J. M. Bathgate, V. C. Manners, C. N. Crush, C. Hammond-Smith, R. Battiscombe, G. H. Bennett, Mears and J. C. Price
„	Kuala Langat D.P.A. ..	Messrs. H. O. Kennedy, G. Fenningworth and W. A. Stanton
„	Kuala Lumpur D.P.A. ...	Messrs. D. S. Gardner, V. Utterson Kelso, W. A. Shelton-Agar, J. Grieve, H. Armstrong, D. R. Barwise and R. G. Ladell
„	Kuala Selangor D.P.A. ...	Messrs. J. Bligh-Orr, N. Fish, A. B. Carey, H. B. Dudley, and Major A. B. Slee
„	Malay Peninsula Agricultural Association ...	The Hon. Mr. Wm. Duncan and the Hon. Mr. R. C. M. Kindersley
„	Negri Sembilan P.A. ...	Messrs. C. Ritchie, V. A. Tayler, J. S. Johnstone, G. W. Hingston and G. B. W. Gray
„	Ulu Selangor D.P.A. ...	Messrs. G. C. Bailey, M. J. Kennaway and R. M. Newton

VISITORS.—Messrs. K. Browne, L. Henderson, H. Anderson, A. B. Cross and W. Thomson.

1.—MINUTES.

The minutes of the Ordinary Meeting held at Sungkai on 12th January, 1921, are confirmed.

2.—WAR RELIEF.

THE SECRETARY tables the following statement of accounts of the Federated Malay States War Relief Fund, Scheme No. 2:

FEDERATED MALAY STATES WAR RELIEF FUND, SCHEME No. 2. STATEMENT OF ACCOUNT, 1ST JANUARY TO 31ST MARCH, 1921.

Receipts.	Amount. £ s. d.
Balance brought forward from last account	37,110 16 3
Proceeds of coupons, £3,000 National War Bonds, 1929	52 10 0
„ „ 5 *per cent.* „ „ 1928	35 0 0
Liquidator, Carrotina Rubber Estate Syndicate (Donation)	73 11 5
„ Georgia Rubber Estate Syndicate (Donation)	23 0 5
	37,294 18 1

Payments.	£ s. d.	Amount. £ s. d.
Grants and gratuities:		
Mrs. ——	40 0 0	
„ ——	37 10 0	
„ ——	20 0 0	
„ ——	60 0 0	
„ ——	50 0 0	
„ ——	75 0 0	
„ ——	50 0 0	
„ ——	25 0 0	
„ ——	60 0 0	
„ ——	50 0 0	
„ ——	30 0 0	
„ ——	50 0 0	
„ ——	50 0 0	
„ ——	30 0 0	
„ ——	40 0 0	
„ ——	11 5 0	
		678 15 0
Balance carried forward		36,616 3 1
		37,294 18 1

The balance of £36,616 3*s.* 1*d.* is disposed of as follows:

	£ s. d.
Five *per cent.* War Loan (£12,000) at cost	11,400 0 0
„ National War Bonds	21,000 0 0
Four *per cent.* Funding Loan (£2,500) at cost	2,000 0 0
On deposit with the Chartered Bank of India	1,500 0 0
Balance of current account with Chartered Bank ...	716 3 1
	36,616 3 1

88, CANNON STREET, LONDON, E.C. 4.

(Sd.) E. L. BROCKMAN,
13th April, 1921.

I hereby certify that I have audited the above statement of receipts and payments with the books and vouchers of the Fund and find the same to be correct. The grants have all been duly authorized by the Committee.

73, BASINGHALL STREET, E.C.,
18th April, 1921.

(Sd.) A. H. CULLEN,
Chartered Accountant,
Honorary Auditor.

3.—ANNUAL REPORT AND ACCOUNTS, 1920-21.

Mr. KENNEDY, before asking that the report and accounts for the past year be adopted, says there are one or two matters which affected the work of the Association during the past year upon which he would like to touch.

First of all, there was his prolonged absence during the year from the work of the Association. At the first Standing Committee meeting that was held after his return from Home, he gave the Standing Committee a plain statement of facts as to how his absence came to be prolonged, and, while he does not intend to labour the matter again to-day, he wishes to state frankly that had he known when he accepted office as Chairman that he would have been absent for so lengthy a period he would certainly never have accepted office at all. However, circumstances arose over which he had no control to prolong his absence, and he can only say that it is a matter that has caused him great concern and profound regret. He wishes to take this opportunity of personally paying a tribute to Mr. Bruce, the Vice-Chairman and Acting Chairman during the greater part of the year. Mr. Bruce, he understands, was in very indifferent health for some time and undertook the work of this Association at times when rest from such work would probably have been better for him. A gracious proposal has been made by the Bahau-Kuala Pilah District Planters' Association that Mr. Bruce be made an Honorary Member of this Association in consideration of his services as Vice and Acting Chairman during the past year. He is sure everyone will heartily endorse that proposal. Whoever puts forward that proposal will, he is sure, also wish to convey to Mr. Bruce the Association's thanks and gratitude for his work on behalf of the Planters' Association of Malaya during the past year, also its sincerest wishes that Mr. Bruce will make a good recovery in the old Homeland and return here fit and well again to undertake the many duties which fall to his lot.

There is another matter to which he would like briefly to refer, and that is the secession of several District Planters' Associations from the Planters' Association of Malaya that has recently taken place. It would appear that at least one of these secessions has been made on the grounds that the Planters' Association of Malaya is not sufficiently representative of the agricultural industries of the country, and while he entirely agrees with this view, he thinks it a great pity that District Associations should secede from the parent Association at so critical a period as that through which the industry is now passing. Rather than abandon the ship in its hour of distress and allow it to drift on the waves of adversity, it would surely have been better for those Associations which have seceded to have stuck to the ship in such a crisis and have endeavoured to advance sound proposals for reconstruction on the lines desired by them in order that they might assist in piloting the Association into a haven of greater strength and security. The question of reconstruction of the Planters' Association of Malaya is one that should engage the serious attention of the incoming Standing Committee. There is no doubt there is a strong feeling

abroad that this Association is not as representative as it ought to be, and with this he is in entire agreement. He recalls that in 1919 Mr. Harvey and himself put forward reconstruction schemes; but it was then considered by many that the schemes put forward went too far and consequently neither was adopted. His opinion to-day is that any scheme put forward must go very much farther than either of those schemes then did.

That the Association is not really representative of all agricultural interests was amply proved during last year when two highly important matters affecting these interests had to be dealt with. He refers to labour, and to rubber restriction. To deal with these matters, two Special Committees had to be organized, namely, the General Labour Committee, and the Rubber Restriction Committee, in order that all interests might be fully represented. It took time and labour to organize these Committees, and valuable time was lost in doing so. Considering the millions sterling at stake in agriculture in the country, surely it should be possible to create a permanent body sufficiently representative of all interests to deal with all important questions that may arise relating to our agricultural industries. At present there are perhaps too many bodies working independently of each other, although, in the main, they are all pretty well working for the same objects. It seems to him that it would be feasible to co-ordinate the work of these bodies and to weld together in one organization the interests of all. In brief, what he thinks is required is a permanent body fully representative of all agricultural interests throughout the Peninsula that would embrace the interests of District Planters' Associations, the Rubber Growers' Association, local rubber companies, proprietary planters, visiting agents, agency firms, and also Chinese interests. If such a representative body were created it should be capable of dealing with all questions that would be likely to arise with regard to agriculture in the Peninsula; also, such a body would be bound to command the ear and respect of Government and people alike. He makes no attempt to put any concrete scheme before the meeting; but, as the recent secessions prove, it is a matter of paramount importance to this Association. He wishes to take this opportunity of remarking upon it.

He refers to the General Labour Committee and Rubber Restriction Committee, and in this connection it has occurred to him that the present occasion is opportune for this Association to show its recognition and appreciation of the valuable work done on these two Special Committees by one who is a past Chairman of this Association, to wit, the Hon. Mr. Wm. Duncan, who is Chairman of both Committees and was practically responsible for the organization of both. Very few people really realize the vast amount of thought, care, and work that Mr. Duncan bestowed on these Committees, and the sound and business-like way in which he performed the work connected with them and won the admiration of all. Unfortunately, the slump negatived much of the good work done by the Labour Committee, but we are not yet out of the wood as regards labour matters, in

fact we are probably just entering it as it is tolerably certain that with a revival in the rubber industry—and this will come, but when is entirely another matter—there will probably be the greatest scramble for labour this country has yet experienced. In view of this possibility the highly important question of labour will no doubt engage the close and continuous attention of the new Standing Committee of this Association.

With regard to the Rubber Restriction Committee, he is sure, the country is highly appreciative of that Committee's efforts to find a solution of the present critical position in which the industry finds itself, and, while the death-knell has been sounded to compulsory restriction by legislation, it is to be hoped that further efforts will yet be made to increase by some means the circle of voluntary restrictors and also the rate of restriction. It is satisfactory to note that conferences have recently been held at Home between the Rubber Growers' Association and those representing Dutch plantation interests, and while he believes schemes for the co-operative selling of rubber were mainly considered at these conferences, we may safely take it that questions regarding restrictive measures to regulate production also were given attention. He is sure that combination of British and Dutch interests would go a very long way towards solving the present critical problems that face the industry.

He says he will ask the Hon. Mr. Kindersley to move a resolution with regard to this Association's appreciation of the valuable work done by Mr. Duncan on these two Committees during the past year.

In conclusion he says that the Planters' Association of Malaya has never held its annual meeting under such foreboding clouds as these which cast their gloom over it at present; but we can perhaps console ourselves with the fact that there is really nothing wrong with the industry at bottom, the fundamental cause of the present depression being undoubtedly the backwash of war. He hopes that when the next annual meeting comes round the present depression will have waned and that we shall again be on the crest of a wave of prosperity.

Mr. Tayler asks for details of the administration expenses appearing in the accounts amounting to $8,250.

Mr. Fraser Brown explains that the amount is made up as follows: Secretary's salary, $7,650; Treasurer's salary, $600.

Mr. Tayler thinks attention should be directed to the growing cost of running the Planters' Association of Malaya and says it is unfortunate that these items should have been lumped together. He points out that in previous years the items were shown separately. He calls attention to the matter for future guidance. He says the cost of running the Association amounted to $16,759 last year and that between 1914-1917 the cost was just under $5,000 *per annum*. In the following two years it rose to an average of $8,000, while in 1919 the amount increased to $10,600 and last year it rose to $16,700. It appears to him that the matter requires the very close consideration of the incoming

Standing Committee. He was unfortunately away practically the whole of last year and was unable to judge from the figures what had been done. The Association has not increased in size and there would seem to be some need for explanation why the expenditure last year should have increased to three times the cost of what it was four years ago. They had also to bear in mind the question of secession which would considerably affect the revenue for the new year. The budget estimates appear to include the subscriptions of the Associations which have already seceded or are about to secede. In his Association, the Negri Sembilan Planters' Association, this growing cost of the Planters' Association of Malaya was felt to be very costly indeed. It had risen exactly 100 *per cent.* since three years ago. In present times, with depression being felt considerably, retrenchment was the cry everywhere, and he thinks it is most essential that the Planters' Association of Malaya should set an example to the planting industry by reconsidering what they are going to spend during the current year. He does not propose to oppose the passing of the accounts. That would be a mistake. The accounts are here and they must be adopted. He merely wishes to give the meeting his views for future guidance.

Mr. KENNEDY points out that the cost of running any institution or business has of necessity largely increased during the last few years, but he is sure that the incoming Standing Committee will give their closest attention to the matter of finance.

Mr. GRABURN asks for particulars of the sum of $690.06 being Standing Committee's expenses.

Mr. FRASER BROWN, in reply, states that the item refers to the previous year's account rendered by members of Standing Committee for attending meetings which were worked out on a mileage basis.

Mr. RITCHIE does not remember his expenses having been paid.

Mr. KENNEDY replies that he has been more fortunate than Mr. Ritchie as his expenses have always been paid.

On the motion of the Hon. Mr. C. Bradbery, seconded by Mr. V. A. Tayler, the report and accounts as presented are adopted.

4.—DECLARATION OF ELECTION OF CHAIRMAN, 1921-22.

Mr. KENNEDY announces the election of Mr. T. J. Cumming as Chairman, Mr. Cumming having polled 246 votes against the Hon. Mr. W. N. Gawler's 36 votes. He is sure that the Planters' Association of Malaya will congratulate itself on having the services of Mr. Cumming as Chairman for the ensuing year. He says Mr. Cumming has long been associated with the Planters' Association of Malaya and has had a great deal of experience with regard to its work and also to the work of the Standing Committee. He mentions that Mr. Cumming takes over the

Chairmanship of the Planters' Association of Malaya at a very critical period and he is sure that he will carry the Association safely through the difficulties which it is likely to encounter.

5.—DECLARATION OF ELECTION OF VICE-CHAIRMAN, 1921-22.

Mr. KENNEDY announces the election of the Hon. Mr. C. Bradbery as Vice-Chairman who polled 168 votes against Mr. C. B. Graburn's 104 votes. He says Mr. Bradbery is a very old member of the Association and one who has taken a very keen interest in it. He is sure Mr. Bradbery will make an excellent Vice-Chairman and that he will be of the greatest assistance to Mr. Cumming during the year.

6.—DECLARATION OF ELECTION OF STANDING COMMITTEE, 1921-22.

Mr. KENNEDY explains that returns have been sent in only from Selangor, Perak and Negri Sembilan. He announces the election of the following:

Selangor	...	Messrs. H. Armstrong, G. H. Bennett, J. Bligh Orr, E. H. King-Harman and E. G. Leyne
Perak ...	...	Messrs. E. L. D. Evans, C. Kenneth Cox and C. B. Graburn
Negri Sembilan		Messrs. C. Ritchie, V. A. Tayler and C. W. Keppel-Powis

Mr. KENNEDY, before vacating the Chair, calls upon the Hon. Mr. Kindersley to move a resolution conveying a vote of thanks to Mr. Duncan for his services as Chairman and Organizer of the General Labour Committee, British Malaya, and also the Special Rubber Restriction Committee.

Mr. KINDERSLEY has great pleasure in moving the resolution. He says Mr. Kennedy has already referred to the very hard work Mr. Duncan has done and he thinks few people realize what great undertakings Mr. Duncan had essayed and how they had necessitated the passing of many nights in the train, sometimes as many as four or five days during a week. In Mr. Duncan the country has a man with three wonderful recommendations, first, he has the confidence of the people of Malaya, secondly, he has the confidence of the Governments of the Federated Malay States and Straits Settlements, and thirdly, he has the confidence of the Rubber Growers' Association in London. He thinks the country is extremely fortunate in that Mr. Duncan should have been here at this particular and critical time and he is sure all are very grateful to him for his good work. He moves the following resolution: "That this Association records its keen appreciation of the valuable work done by the Hon. Mr. William Duncan as Chairman of the General Labour Committee, and the Special Restriction Committee, and it wishes to offer him its sincere thanks for the hard work he has undertaken on behalf of the planting industry."

Mr. BRADBERY seconds the motion which is carried unanimously, amidst applause.

Mr. KENNEDY then vacates the Chair which is occupied by Mr. Cumming.

Mr. CUMMING thanks the Association for the honour it has conferred upon him in electing him as Chairman. He is aware that the year is to be a very difficult one and if it is to be a successful year he, as Chairman, must have the support of everyone, not only of the Association, but of District Planters' Associations, managers and assistants upon estates. He thinks the Association must be strengthened if anything is to be done during the present year. To do so they must have the support of all, those who indulge in destructive criticism should be the first to strengthen the Association. He has pleasure in endorsing Mr. Kennedy's eulogy to Mr. John Bruce and he is pleased to see a resolution on the agenda to make Mr. Bruce an Honorary Member of the Association. It was unfortunate that Mr. Kennedy had been kept away during a large portion of last year; but he sincerely hopes that the Association will have the benefit of Mr. Kennedy's advice and help during the current year.

Mr. KENNEDY thanks Mr. Cumming and assures him that if the Association desires his services he will be glad to do all in his power to serve it.

Mr. BRADBERY thanks the members for the honour they have conferred upon him in electing him Vice-Chairman and says he will do his utmost to help the Chairman in his work on behalf of the Association.

7.—PLANTERS' BENEVOLENT FUND OF MALAYA.

Mr. CUMMING says that a draft Enactment further to amend the principal Enactment has been approved both by the Standing Committee and the Corporation at the annual meeting held earlier in the day. He says that the Bill, when it becomes an Enactment, will make for the more efficient working of the Corporation. He tables the Bill which reads as follows:

FEDERATED MALAY STATES.

ENACTMENT No. OF **1921.**

An Enactment further to amend "The Planters' Benevolent Fund Enactment, 1912."

[, 1921.]

President of the Federal Council.

IT is hereby enacted by the Rulers of the Federated Malay States in Council as follows:

Short title and commencement.

1. (i) This Enactment may be cited as "The Planters' Benevolent Fund Enactment, 1912, Amendment Enactment, 1921," and shall come into force on the publication thereof in the *Gazette*.

Construction.

(ii) This Enactment shall be read and construed as one with "The Planters' Benevolent Fund Enactment, 1912," hereinafter called "the principal Enactment" and copies of that Enactment printed after this Enactment shall have come into force may be printed with the amendments made by this Enactment.

Repeal of section 6 and substitution of new section Standing Committee.

2. Section 6 of the principal Enactment is repealed and the following section is substituted therefor:

"(6) The Standing Committee shall consist for the time being of the Standing Committee of the Planters' Association of Malaya."

Repeal of section 8 and substitution of new section. Executive Committee.

3. Section 8 of the principal Enactment is repealed and following section is substituted therefor:

"(8) (i) The Standing Committee shall have power to appoint annually an Executive Committee consisting of the Chairman, Vice-Chairman, Secretary and Treasurer for the time being of the Planters' Association of Malaya together with three other persons, who may or may not be planters, to deal with all cases of emergency which may arise between the meetings of the Standing Committee.

(ii) Four members of the Executive Committee shall be a quorum."

Repeal of section 9 and substitution of new section. President and Vice-President.

4. Section 9 of the principal Enactment is repealed and the following section is substituted therefor:

"(9) The Chairman and Vice-Chairman for the time being of the Planters' Association of Malaya shall be President and Vice-President and Chairman and Vice-Chairman of the said Corporation and Chairman and Vice-Chairman of the said Standing Committee: provided that if the Chairman and Vice-Chairman for the time being of the Planters' Association of Malaya should be unwilling to act as President and Chairman or Vice-President and Vice-Chairman, respectively, of the Corporation, or Chairman or Vice-Chairman of the Standing Committee, a person appointed by the Corporation at a special general meeting convened for the purpose shall be President and Chairman or Vice-President and Vice-Chairman as aforesaid."

Amendment of section 10.

5. Section 10 of the principal Enactment is amended as follows:

(*a*) by inserting in line 1 thereof after the word "Secretary" the words " and Treasurer"

(*b*) by inserting in line 2 thereof after the word "be" the words "respectively the"

(*c*) by inserting in line 3 thereof after the word "Secretary" the words "or Treasurer"

(*d*) by inserting in line 5 thereof after the word "person" words "or persons"

(*e*) by deleting in line 7 thereof the word "and" and substituting therefor the word "or" and by inserting after the word "Treasurer" the words "as the case may be".

6. Section 19 of the principal Enactment is repealed and the following section is substituted therefor:

Repeal of section 19 and substitution of new section. Chair at meetings.

"(19) The President and Chairman of the Corporation shall if present preside at all meetings of the Corporation and of the Standing Committee and of the Executive Committee and in his absence the Vice-President and Vice-Chairman shall preside or in the absence of both the members present shall elect a Chairman for the occasion. The President or Vice-President or in their absence the Chairman, shall have a casting vote in addition to his own original vote."

7. Section 22 of the principal Enactment is repealed and the following section is substituted therefor:

Repeal of section 22 and substitution of new section. Seal.

"(22) The seal of the Corporation shall not be affixed to any instrument whatsoever except in the presence of the Chairman or Vice-Chairman or one other member of the Standing Committee and of the Secretary, who shall sign their names to the instrument in token of their presence, and such signing shall be independent of the signing of any person as a witness."

OBJECTS AND REASONS.

The existing Standing Committee of the Fund has been found to be unwieldly consisting as it has of 30 members. This Enactment reduces that number by 10 and the Standing Committee of the Planters' Association of Malaya will henceforth be the Standing Committee of the Fund.

The Executive Committee has proved not to have been composed of sufficient members adequately to discharge its duties but by the provision of a large number of members thereof and by the fixing of a quorum it is considered that in future the Executive Committee will be found to be an effective organization. The remaining sections of this Enactment enact that the Vice-Chairman and Treasurer of the Planters' Association of Malaya shall be the Vice-President and Treasurer respectively of the Fund and the Vice-Chairman and Treasurer respectively of the Standing Committee thereof and make the necessary ancillary provisions.

8.—LABOUR MATTERS.

The SECRETARY reads the following letter in *re* recruiting licences:

"KUALA LUMPUR,
"*14th May, 1921.*

"No. 206/21.

"SIR,

"As it has been stated that there is a certain amount of discrepancy between certain letters issued by the Deputy Controller of Labour, Penang, and Assistant Controller of Labour, Kuala Lumpur, respectively, on the subject of recruiting licences, I have the honour to inform you that the procedure herein set out should be followed.

"2. If an employer has a kangany in India who is not recruiting at present, and the employer at any time wishes him to start recruiting operations, he should fill in the particulars on a licence and send it to the Deputy Controller of Labour, Penang, for registration.

"The latter will register it and send it by the first mail to the Emigration Agent, Madras, or the Superintendent, Emigration Depôt, Negapatam, as the case may be, for delivery to the kangany. The employer should by the same mail send his instructions to the kangany, who should apply to our Agent for his licence which will be awaiting him.

"3. This procedure will cause no undue delay, and will obviate the necessity for keeping a number of dormant licences in India which may never be utilized.

"I have, etc.,
"(Sd.) W. PEEL,
"Acting Controller of Labour, S.S. and F.M.S.

"THE SECRETARY,
"PLANTERS' ASSOCIATION OF MALAYA,
"KUALA LUMPUR."

Mr. GRABURN enquires the date of the letter.

The SECRETARY states that the letter is dated the 14th instant.

9.—RUBBER EXHIBITION, 1921.

The SECRETARY states that some months ago the Government invited the Planters' Association of Malaya and the Rubber Growers' Association to organize, take charge of and manage an exhibit from Malaya. An Exhibition Committee was duly appointed and had organized an exhibit. Nearly 20,000 lbs. of rubber of all grades together with other exhibits including locally manufactured rubber goods, rubber seeds, specimens, and also photographs showing the various stages of rubber cultivation from the clearing of land for planting to the despatch and shipping of rubber were collected and sent forward. The Committee also forwarded the Federated Malay States and Straits Settlements Department of Agriculture's mycological and other interesting exhibits, and had collected subscriptions amounting to about $1,000 from local companies, of which certain sums will have to be returned to companies which have subcribed in London in response to the Rubber Growers' Association's appeal. The Federated Malay States Government voted $10,000 unconditionally and this has been sent to the Exhibition Committee in London. He says the Association's representatives at the Exhibition are Mr. F. Clyde Jeavons, Capt. H. L. Carter, Mr. C. E. S. Baxendale and Mr. Leonard Wray, I.S.O.

Mr. HENDRIE asks whether all members of the Planters' Association of Malaya were invited to subscribe and to send exhibits.

The SECRETARY replies in the affirmative.

Mr. HENDRIE says he received no appeal or invitation.

The SECRETARY states that every estate in the Peninsula of over 100 acres in extent was invited to subscribe and to send exhibits and that all Constituent Associations were written to.

10.—MOTOR AMBULANCES.

The SECRETARY submits the following correspondence:

"SIR,

"MOTOR AMBULANCES.

"I have the honour to inform you that at the last meeting of this Association it was unanimously resolved that, in view of the difficulties experienced in transporting cases of accidents and other serious cases of illness to hospitals, Government be asked to make motor ambulances available throughout the country.

"I have, etc.,
"(Sd.) C. WARD-JACKSON,
"*Secretary.*

"THE HON'BLE
"THE CHIEF SECRETARY TO GOVERNMENT,
"FEDERATED MALAY STATES,
"KUALA LUMPUR."

"KUALA LUMPUR,
"FEDERATED MALAY STATES,
"*April, 1921.*

"No. G. 6352/1920.

"SIR,

"With reference to your letters regarding motor ambulances I am directed to forward to you the enclosed list of Ford motor ambulances, showing the stations which possess them and the number at each station.

"2. In addition Sunbeam ambulances are on order and expected to arrive next month for Kuala Lumpur, Taiping, Ipoh, Seremban and Raub.

"I have, etc.,
"(Sd.) A. S. JELF,
"*Acting Under Secretary, F.M.S.*

"THE SECRETARY,
"PLANTERS' ASSOCIATION OF MALAYA,
"KUALA LUMPUR."

"List of Ford Motor Ambulances.

Stations.	No.
Parit Buntar	1
Taiping	1 *
Kuala Kangsar	1
Ipoh	1 *
Batu Gajah	1
Tapah	1
Sungkai	1
Telok Anson	1
Kuala Kubu	1
Kuala Lumpur	2 *
Seremban	1 *
Kuala Pilah	1
Jelebu	1
Raub	3 †
Total ...	17

"(Sd.) R. Dowden,
"*Principal Medical Officer, F.M.S.*"

Mr. Keppel-Powis considers the matter to be highly satisfactory.

Mr. Kennedy states that at the Indian Immigration Committee meeting held the previous day he talked the matter over with the Principal Medical Officer, Dr. Dowden, who asked him to announce that if any estate had any serious case of illness and if a telephone message were sent an ambulance would be sent to convey cases to hospitals. A very small charge will be made to cover cost of petrol, etc.

Mr. Bennett says the list is a very excellent one but he wonders whether all the ambulances are in working order. He says he called for one from Klang and was informed that the ambulance was not in order and that it would take a week to repair it.

Mr. Gordon Graham is not aware of the existence of the ambulance which is supposed to be stationed at Sungkai.

Mr. Cumming remarks that the Sungkai ambulance has probably broken down.

"* Will also have a Sunbeam 1st class patients' ambulance.

"† Garages at Kuala Lipis and Kuantan not yet ready.

11.—REGISTRATION OF DRESSERS.

Mr. CUMMING refers to the correspondence on this subject appearing on the agenda and says the recommendation of the Special Committee consisting of Messrs. C. Ritchie, C. W. Keppel-Powis and the Hon. Mr. C. Bradbery, which was appointed to enquire into the subject is before them. The question which is to be decided is whether in view of the Special Committee's finding, it is advisable to pursue to subject.

The SECRETARY submits the following correspondence:

"C.W.J./C.S.

"SIR,

"REGISTRATION OF DRESSERS.

"I have the honour to inform you that at the last meeting of this Association the following resolutions were passed unanimously:

(*a*) That Government be approached regarding the registration of dressers throughout the Federated and non-Federated Malay States and the Straits Settlements.

(*b*) That a Central Registration Office be established.

(*c*) That a register be kept of all men holding any form of dresser's qualifications and that certified copies of any entry in such register be supplied on application to any estate manager.

(*d*) That the registrar be a medical officer.

"I have, etc.,
"(Sd.) C. WARD-JACKSON,
"*Secretary.*

"THE HON'BLE
"THE CHIEF SECRETARY TO GOVERNMENT,
"KUALA LUMPUR."

"KUALA LUMPUR,
"*25th January, 1921.*

"No. G. 6353/1920.

"SIR,

"In reply to your letter on the subject of the registration of dressers, I am directed to inform you that the Chief Secretary, after obtaining the views of the Principal Medical Officers of the Federated Malay States and the Straits Settlements, is not prepared to take any action in the matter at present.

"2. The Principal Medical Officer, Federated Malay States, is of opinion that registration would be useful but states that it would require a special office and that it would waste a medical officer to put him on such work. He does not think there is any urgent need for this.

"I have, etc.,
"(Sd.) A. S. JELF,
"*Acting Under Secretary, F.M.S.*

"THE SECRETARY,
"PLANTERS' ASSOCIATION OF MALAYA,
"KUALA LUMPUR."

"1. The Sub-Committee do not think registration would be of much value—or likely to be undertaken by Government—without some standard of qualification, which means some sort of examination, previous to registration.

"2. The Sub-Committee think the Association should realize this, and not proceed further in the matter unless its members are prepared to enter their dressers for the examinations provided (or to be provided in future) by Government.

"The Sub-Committee also think the possibility of its being made compulsory to employ qualified dressers should be borne in mind.

"3. If it is decided to go on with the matter, the Sub-Committee suggest that Government be asked (*a*) to give certificates to at least two grades of dressers, (*b*) to hold the examinations periodically, and at local centres.

Mr. RITCHIE, as a member of the Sub-Committee, says the Committee were of opinion that registration without some sort of qualification would hardly be considered by Government as it would not be of much value. The mere fact of a man having been employed on an estate is hardly sufficient to warrant his registration as a dresser. It seems to him that they must first decide whether they wish to have the dresser qualified by Government and in that connection they must remember the possibility of it being made compulsory to employ qualified dressers. Consequently, they must set about the matter with their eyes open. An effort had been made by the Indian Government some time ago to provide qualified men in charge of hospitals. The dressers in charge of estates hospitals at present have some qualifications. If it is decided to go on with the matter the Sub-Committee suggest that Government be asked to give certificates to at least two grades of dressers and to hold examinations periodically and at local centres.

Mr. GRABURN asks whether it is necessary for a medical officer to be responsible for the registration of dressers.

Mr. CUMMING says the Committee do not think registration will be of much value without some sort of qualification which of course would entail some sort of examination.

Mr. GRAY says that in Ceylon there is a system whereby dressers are approved by the Principal Medical Officer and he suggests that the Association adopt the Ceylon system. He does not think there is any need for a medical officer to examine dressers before they are registered.

Mr. BRADBERY believes that Government held examinations for dressers at King Edward VII Medical School, Singapore. If this is so, and estates would send their dressers up for examination, Government might be induced to institute registration.

Mr. RITCHIE says he has received a letter from the Principal Medical Officer that examinations for dressers will be held next month in Taiping or Ipoh. He does not bring up the matter for consideration to-day, but if the Association decides to go further into the matter Government could be asked to hold these examinations for dressers at regular periods and at different centres.

Mr. EVANS understands that examinations are held periodically but he believes that most of the dressers always failed.

Mr. O'HARA HICKSON says that with all deference to previous speakers he does not think that the subject should be pushed forward at the present time. They would probably find the question being asked why all estates do not employ fully qualified assistant surgeons. Further he believes that the grey matter of the executive of this country was being overtaxed by many more urgent and important matters.

Major SLEE differs from the previous speaker and does not think there is anything more important than the health of their estate labourers.

Mr. GRABURN supports Major Slee.

Mr. CUMMING thinks the matter should be referred back to the Standing Committee, and this is agreed to.

12.—RUBBER GROWERS' ASSOCIATION'S LOCAL COMMITTEE.

Mr. CUMMING says that the local committee of the Rubber Growers' Association appear to have lost touch with the Planters' Association of Malaya. Some believe that the Rubber Growers' Association's local committee has taken upon itself to look after the industry without reference to the Planters' Association of Malaya but in fact the Rubber Growers' Association's local committee really belongs to the Planters' Association of Malaya.

He asks the Secretary to read extracts from correspondence which shows how the Rubber Growers' Association's local committee came to be formed.

The SECRETARY reads the following extract from an enclosure to a letter dated 11th December, 1914, sent by the Secretary of the Rubber Growers' Association to the Secretary of the Planters' Association of Malaya:

> "That the Committee (of the Council of the Rubber Growers' Association) are of opinion that it is desirable to arrange for representation of this Association in Ceylon and the Malay States.
>
> "They are of opinion that the best means of arranging for this is as follows:
>
> "That the Planters' Association of Malaya be asked to appoint a small Committee consisting of eight planting members in conjunction with four mercantile members to be appointed by the local Chamber of Commerce.
>
> "The Secretary and Chairman of the Planters' Association to be members *ex officio*.
>
> "Such Committee to act as advisers and correspondents of the Rubber Growers' Association as well as their representatives in all matters affecting the interests of the rubber growing industry."

He also reads the following extract from a letter dated 25th January, 1915, sent by Mr. Eric Macfadyen as Chairman of the Planters' Association of Malaya to the then Chairman of the Rubber Growers' Association:

> "I suggest, however, some modifications of the constitution of the proposed Committee as we find large Committees never meet in this country; and for working purposes it is better to have a fairly small Committee of men fairly centrally situated. I suggest your Committee should consist of the Chairman of this Association and the Kuala Lumpur Chamber of Commerce, three members appointed by this Association and two by that Chamber with the Secretary of this Association as Secretary."

Major SLEE enquires whether the suggestions just read have been carried out and who is the present Chairman?

Mr. CUMMING believes that the suggestions were carried out until last year but as the present Chairman, the Hon. Mr. Wm. Duncan, is here, he will perhaps be good enough to make some pronouncement on the matter.

Mr. DUNCAN says some months ago he was invited to become, temporarily, Chairman of the Rubber Growers' Association's local committee. He thought that the Chairman of the Planters' Association of Malaya was Chairman of the Local Committee.

However, he accepted the invitation and at the last meeting it was decided that the new Chairman of the Planters' Association of Malaya, Mr. Cumming, should become Chairman of the local committee of the Rubber Growers' Association.

13.—STATISTICS.

Mr. Ritchie calls attention to the reference to this subject made in the annual report. He thinks everybody who has watched the grave difficulties through which the rubber industry is passing must have been strongly convinced of the woeful lack of statistics with regard to all matters in connection with rubber, and he would urge the Association to give the incoming Standing Committee an open mandate to go into the matter of statistics and to consider whether the Association itself had the statistics it ought to have and if not why steps should not be taken to collect and compile statistics pertaining to the rubber industry, thus enabling the Association to go to Government and to ask them to bring into force the Bureau of Statistics Enactment. He would point out that by perusing the statistics given by the Johore Planters' Association in its last year's annual report a very good idea would be obtained of what could be done in the way of compiling statistics.

Mr. Miller Mackay lays stress on the fact that when the rubber industry was in such a difficulty it was of paramount importance that they should be able to obtain reliable statistics of the industry. He alleges inaccuracies in the figures of the estimated production of rubber for the coming year as appearing in the Planters' Association of Malaya annual report.

Mr. Cumming refers to a meeting held the previous day at which a resolution was passed asking for a rubber census.

Major Slee proposes that the resolution referred to should be repeated from the Planters' Association of Malaya.

Mr. Kennedy seconds and it is resolved to forward the resolution referred to.

14.—HONORARY MEMBER.

Mr. Keppel-Powis, on behalf of the Bahau-Kuala Pilah District Planters' Association, proposes that Mr. John Bruce be made an Honorary Member of the Association in consideration of his services as Vice and Acting Chairman during the past year.

Mr. Wilson, on behalf of the Batang Padang District Planters' Association, has pleasure in seconding the motion which is carried unanimously, amidst applause.

15.—BUDGET FOR 1921-22.

Mr. Cumming submits the following estimates which were approved and passed by the retiring Standing Committee:

Estimated Expenditure, 1921-22.

	$
Publications, printing and stationery ...	2,500
Library	100
Rent	500
Legal advice	250
Standing Committee	1,000
Administration charges	9,000
Travelling and other contingencies ...	300
Postage	500
	14,150

Assessment 2½ cents per planted acre will give a revenue of $17,067 showing an estimated surplus of $2,917.

	Planted	
Bahau-Kuala Pilah D.P.A....	22,040	acres
Batang Padang D.P.A. ...	21,866	,,
Central Pahang P.A. ...	7,761	,,
Central Perak P.A.	32,476	,,
Johore P.A.	102,333	,,
Kajang D.P.A.	36,894	,,
Klang	71,071	,,
Kelantan P.A.	17,229	,, (last year's)
Kuala Langat D.P.A. ...	34,041	,,
Kuala Lumpur D.P.A. ...	34,223	,,
Kuala Selangor D.P.A. ...	44,785	,,
Lower Perak P.A.	48,578	,,
M. P. A. A.	77,229	,,
Negri Sembilan P.A. ...	112,692	,,
Ulu Selangor D.P.A. ...	19,462	,,
	682,680	
×	2.5	
	1,365,360	
	3,413,400	
	$ 17,067	

Mr. TAYLER draws attention to the increasing cost of the administration. He questions whether certain items in the estimates are correct and instances that the subscription from the Lower Perak District Planters' Association included in the estimates although he understands this District Planters' Association has seceded from the Planters' Association of Malaya.

Mr. CUMMING says the question of the secession of the Lower Perak Planters' Association has yet to be considered by the Standing Committee.

Mr. TAYLER suggests that the Budget be referred back to the Standing Committee.

Mr. JOHNSTONE seconds the proposal which is agreed to.

16.—GENERAL.

Mr. GRABURN understands that it is customary to publish a summary of the proceedings of the Standing Committee meetings but that no such summary is included in the agenda of to-day's meeting. He thinks that the summary should also be published in the local Press as the time between meetings of the Standing Committee and the publication of the agenda may be far apart and members would be apt to overlook important matters.

Mr. CUMMING says the matter is one for the Standing Committee itself to decide.

Mr. GRABURN wishes to know why a summary of the proceedings of the last Standing Committee meeting was not published in to-day's agenda.

The SECRETARY replies that the agenda as submitted to-day was duly passed by the Standing Committee at their meeting held on the 20th ultimo.

Mr. GRABURN asks if the summary was omitted for any special reason.

The SECRETARY states that he has nothing to add to the reply already given to Mr. Graburn.

Mr. TAYLER asks for information about the Planters' Benevolent Fund. He states that it has been the custom to elect the Standing Committee of that Corporation at the annual general meetings of this Association.

Mr. CUMMING refers to the draft Bill already tabled.

Mr. BAILEY speaks of the necessity for the control of pests and diseases in areas that have gone out of cultivation or which are just carrying on. *Corticium salmonicolor*, or pink disease, he believes, is increasing to an alarming extent in native holdings

and this and similar diseases constitute a serious menace to the planting industry. He suggests that the incoming Standing Committee consider the matter and communicate with the Department of Agriculture with a view to preventing the further spread of diseases.

Agreed to.

Mr. ARMSTRONG gives notice of a motion to alter the Rules of the Association.

Mr. MILLER MACKAY asks if the Association has considered the reply from the Secretary of State for the Colonies in the matter of rubber restriction by legislation.

Mr. CUMMING is not sure that the matter is one which comes within the province of this Association.

Mr. MACKAY asks if the Association cannot deal with the matter who can. He says the Batang Padang District Planters' Association suggests a taxation of 10 *per cent.* on the rubber output.

The CHAIRMAN reiterates the view that the matter is not one which can be dealt with by this Association. He says the Government invited Mr. Duncan to form a Special Committee and that that Committee was dealing with all matters appertaining to restriction. He suggests that if the Batang Padang District Planters' Association have any scheme of their own it should be sent forward to Mr. Duncan's Committee for scrutiny and consideration. He asks those in favour of the Association putting forward a restriction scheme to signify in the usual manner.

There being no reply,

Mr. REEVE-TUCKER thinks it should be widely advertised that the Duncan Restriction Committee is willing to receive and investigate any scheme which may be put forward.

Mr. DUNCAN says the matter of restriction is a very complicated and delicate one. He believes that the planting community is unanimously of opinion that the only way to overcome the difficulty is by compulsory restriction by legislation. He does not think there could have been a more unanimous decision of planters. A public meeting was held recently and there were more than 75 present and the resolution for compulsory restriction was unanimously carried. A scheme was put forward and accepted by London but the Secretary of State for the Colonies had finally turned it down. The Secretary of State's decision was based on three reasons, the chief of which was the financial aspect. Since then seven schemes had come within his notice but not one of them was without defect. There were objections to all of them and in his opinion no perfect restriction scheme had been evolved. What they had to do now was again to examine those schemes very closely and see which one had the fewer

defects or to combine one or two or more together. If and when they arrived at some decision, the scheme could then be submitted at a public meeting and the matter could go forward if approved by the meeting. He gives some figures of the restriction that was being practised by some estates and says it showed that local producers were doing very much more than the Rubber Growers' Association asked them to do. His Committee was examining all the schemes and they would do their best to see what could be done to save the situation. He signifies his willingness to go to Java and Sumatra to confer with Dutch producers if any useful purpose is likely to be served thereby.

Mr. CUMMING is sure that the matter will be safe in the hands of Mr. Duncan and the Special Committee. He announces that Dr. Braddon will be pleased to expound his scheme at 2.30 this afternoon.

Mr. KENNAWAY wishes to support Mr. Graburn's suggestion that the summary of proceedings of the Standing Committee meetings should be published.

Mr. BENNETT says the subject of the registration of servants has been discussed by the Klang District Planters' Association which is of opinion that the matter should be brought up again and strongly supported at the next meeting of this Association.

Mr. CUMMING suggests that this be referred to the Standing Committee.

Agreed to.

With a vote of thanks to the Chair, the meeting terminates at 12.45 p.m.

C. WARD-JACKSON,
Secretary.

Abstract of Meteorological Readings in the various districts of Malaya for the month of January, 1921.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kelantan, Kota Bahru ...	...	140.0	77.7	83.67	72.51	11.16	74.2	.779	71.8	82.	...	31.76	9.80
Pahang, Kuala Lipis	...	...	77.6	88.09	72.67	15.42	74.1	...	...	...	...	14.05	2.10
Johore, Johore Bahru	...	...	...	84.46	72.48	11.98	...	...	...	...	...	22.69	6.88
Singapore, Kandang Kerbau ...	1008.8	158.0	79.7	85.8	73.2	12.6	75.8	.837	...	83.	Calm	16.58	5.66
Malacca, Durian Daun ...	1011.3	130.0	80.0	86.0	72.0	14.0	76.0	.874	...	86.	N.E.	10.01	1.85
Negri Sembilan, Seremban ...	...	148.6	78.1	84.4	71.9	12.5	74.8	.802	72.5	79.8	N.W.	5.41	3.18
,, Kuala Pilah ...	...	154.2	81.5	89.5	...	...	79.2	.948	77.3	88.6	...	12.81	3.32
,, Port Dickson	...	110.2	79.7	83.8	72.9	10.9	76.6	.863	74.3	81.2	...	4.49	3.37
Selangor, Kuala Lumpur ...	29.818	151.9	80.6	90.3	72.7	17.6	77.6	.884	75.6	84.	S.E.	9.71	1.48
,, Klang	...	...	78.4	82.9	75.0	7.9	75.6	...	...	...	...	11.93	1.87
,, Kuala Selangor ...	...	...	...	89.4	74.4	15.0	...	...	...	...	...	12.55	3.14
,, Rawang	...	...	...	88.9	73.2	15.7	...	...	...	...	...	8.33	1.65
Perak, Telok Anson	...	...	79.94	91.0	70.0	21.0	76.64	.873	...	87.	...	12.36	1.92
,, Ipoh	...	...	78.31	93.0	68.0	25.0	74.87	.821	73.39	86.	...	8.66	1.57
,, Taiping	...	112.0	80.29	90.0	69.0	21.0	76.07	.843	...	82.	...	5.66	.90
,, The Cottage	...	...	...	...	...	...	...	...	...	...	...	13.74	4.48
,, Parit Buntar	...	...	81.48	92.0	71.0	21.0	76.24	.835	...	78.	...	4.33	1.49
Penang, George Town	1009.4	147.9	80.9	86.4	72.5	13.9	77.0	.864	64.1	81.6	N.W.	4.95	2.51
Kedah, Alor Star	...	...	...	...	...	...	...	...	...	...	...	3.92	1.09
Perlis, Kangar	...	...	...	...	...	...	...	...	...	...	...	...	...

Abstract of Meteorological Readings in the various districts of Malaya for the month of February, 1921.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kelantan, Kota Bahru	...	140.31	78.5	86.00	71.67	14.32	73.9	.751	70.7	77.	...	1.74	.60
Pahang, Kuala Lipis	...	...	79.16	83.03	72.17	10.86	74.79	...	...	...	...	4.56	1.10
Johore, Johore Bahru	...	...	...	85.77	72.19	13.58	...	...	...	...	...	8.72	2.78
Singapore, Kandang Kerbau ...	1008.9	157.5	80.4	86.6	73.2	13.4	76.0	.836	...	80.	Calm	8.53	3.87
Malacca, Durian Daun	1010.1	127.0	80.0	87.0	73.0	14.0	76.0	.887	...	84.	N.E.	3.85	.78
Negri Sembilan, Seremban ...	...	154.9	79.5	86.4	71.7	14.7	77.3	.855	74.8	80.	N.W.	2.85	1.29
,, Kuala Pilah ...	...	159.1	81.8	89.5	...	...	79.3	.951	77.5	87.4	...	4.63	2.04
,, Port Dickson	...	...	83.0	86.6	73.3	13.3	76.6	.837	73.7	78.5	...	3.07	1.02
Selangor, Kuala Lumpur ...	29.779	151.8	81.5	91.2	71.8	19.4	77.8	.883	75.2	81.	S.E.	2.63	1.83
,, Klang	...	...	79.1	84.0	77.5	6.5	75.8	...	...	...	...	6.23	1.78
,, Kuala Selangor ...	...	...	...	90.22	74.7	15.4	...	...	...	...	...	2.92	1.24
,, Rawang	...	...	...	90.0	74.2	15.8	...	...	...	...	...	3.17	1.41
Perak, Telok Anson	...	...	81.19	90.0	70.0	20.0	76.96	.871	...	82.	...	9.88	1.85
,, Ipoh	...	...	81.30	94.0	70.0	24.0	76.09	.829	74.31	78	...	5.51	1.45
,, Taiping	...	110.0	80.67	91.0	69.0	22.0	76.49	.856	..	82	...	13.11	2.00
,, The Cottage	...	...	...	...	...	...	...	...	...	...	...	6.73	2.16
,, Parit Buntar	...	...	82.04	92.0	71.0	21.0	77.19	.863	...	81	...	5.84	1.33
Penang, George Town	1009.3	154.0	82.0	94.0	69.0	25.0	76.5	.836	62.	77.5	N.W.	8.11	5.63
Kedah, Alor Star	...	...	...	...	...	...	...	...	...	...	...	.24	.17
Perlis, Kangar	...	...	...	...	...	...	...	...	...	...	...	...	...

Abstract of Meteorological Readings in the various districts of Malaya for the month of March, 1921.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kelantan, Kota Bahru	...	139.06	80.1	87.64	73.61	14.03	75.9	.815	73.1	79.	...	20.06	5.15
Pahang, Kuala Lipis	...	...	80.3	83.67	72.29	11.38	82.5	...	...	...	...	8.79	1.93
Johore, Johore Bahru	...	...	...	87.72	72.89	14.83	...	...	...	...	...	11.61	2.15
Singapore, Kandang Kerbau ...	1008.6	160.0	81.2	88.1	74.2	13.9	77.5	.879	...	77.	Calm	8.91	2.04
Malacca, Durian Daun... ...	1018.1	129.0	81.0	87.0	74.0	13.0	77.0	.900	...	80.	N.E.	7.10	2.36
Negri Sembilan, Seremban ...	...	149.8	80.4	85.7	71.5	14.2	76.2	.875	74.2	84.9	S.W.	7.21	1.49
„ Kuala Pilah ...	...	156.5	81.7	90.4	...	...	79.6	.963	77.9	87.3	...	9.84	1.65
„ Port Dickson	...	114.1	81.9	88.6	74.1	14.5	75.1	.866	72.4	77.1	...	4.14	1.92
Selangor, Kuala Lumpur ...	29.803	...	80.7	90.7	73.5	17.2	76.5	.856	74.5	81.	S.E.	10.07	3.15
„ Klang	...	...	79.6	84.4	76.2	8.2	76.4	...	...	...	...	8.88	2.40
„ Kuala Selangor ...	...	...	...	89.9	74.7	15.2	...	...	...	...	...	4.60	1.99
„ Rawang	...	...	...	92.7	78.0	14.7	...	...	...	...	...	7.00	1.61
Perak, Telok Anson	...	...	81.38	91.0	72.0	19.0	77.56	.894	...	85.	...	10.46	3.07
„ Ipoh	...	...	80.6	94.0	72.0	22.0	76.08	.838	77.14	80.	...	19.95	3.50
„ Taiping	...	110.0	80.89	93.0	71.0	22.0	76.94	.875	...	85.	...	20.07	1.73
„ The Cottage	...	...	...	...	...	...	...	...	...	...	...	24.21	3.57
„ Parit Buntar	...	...	81.71	92.0	71.0	21.0	77.44	.885	...	83.	...	16.57	2.77
Penang, George Town	1008.3	164.0	82.4	93.0	69.0	24.0	77.4	.875	...	80.	N.W.	14.17	3.07
Kedah, Alor Star	...	...	...	...	...	...	...	...	...	...	...	9.52	2.72
Perlis, Kangar	...	...	...	...	...	...	...	...	...	...	...	...	...